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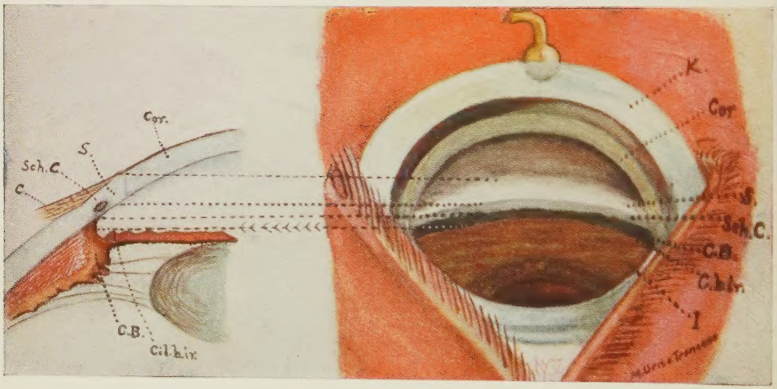
PLATE I.



Gonioscopy and its Clinical Applications.—Troncoso, page 17. (*Amer. Jour. Ophth.*)

Plates through the courtesy of the American Journal of Ophthalmology.

DESCRIPTION OF PLATE I.

The angle of the anterior chamber of a normal eye, as seen through Koeppe's contact glass and the gonioscope. Semischematic picture showing the correspondence of the different structures with those of a microscopic section of the eye. I, iris; Cil. b. ir., ciliary border of the iris; CB, ciliary body; Sch. C., zone of the sclerocorneal trabeculum covering the Schlemm canal; S, sclera; Cor, cornea; K, contact glass.

DESCRIPTION OF PLATE II.

Fig. 5.—R.E. Normal angle as seen in the whole field of the gonioscope. Nasal part. C. b. i., ciliary border of the iris; C.B., ciliary body; Sch. zo., Schlemm zone; Sch., sclera; Cor., cornea.

Fig. 6.—R.E. Normal angle, whole field, upper part. Same letters as for other figure. A brilliant white line is seen above Schlemm zone.

Fig. 7.—R.E. Normal angle, temporal part. Iris processes on ciliary border of the iris. Schlemm zone of the same color as the sclera.

Fig. 8.—L.E. Normal angle, temporal part. I. pr., Iris processes on border of the iris concealing the ciliary body, C.B., in lower part. Sch. zo., Schlemm canal partially filled with blood, which is collected along the inner and outer walls.

Fig. 9.—Normal ciliary processes in a case of intraocular foreign body for removal of which an iridectomy was done. The left border of the coloboma is adherent to the wound and a thin membrane reaches down to the ciliary processes.

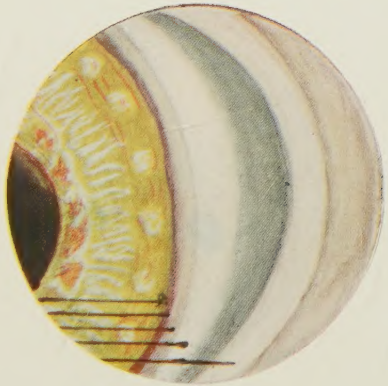
Fig. 10.—Normal angle. Senile pigmentation of the Schlemm zone. Border of the iris very high, concealing the ciliary body.

Fig. 11.—Same eye after the use of eserin. The ciliary body is visible all over the angle.

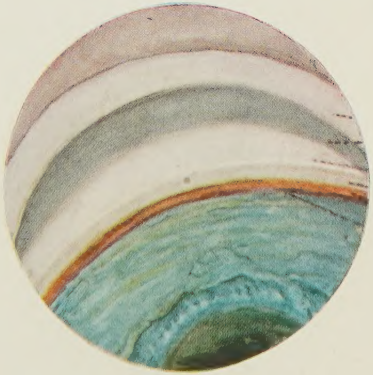
Fig. 12.—R.E. Nasal angle, atrophy of iris. In the root a white-reddish, sharply limited band, where the pigment and reliefs have disappeared, stands out conspicuously. New formed vessels. Ciliary body of a light brown color. Schlemm zone slightly broader.

PLATE II.

FIG. 5



C. B. 1...
C. B.....
Sch. 20..
Scl.....
Cor.....



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.....Scl.
..Sch. 20
....C. B.
.....Chi.

FIG. 6

FIG. 7

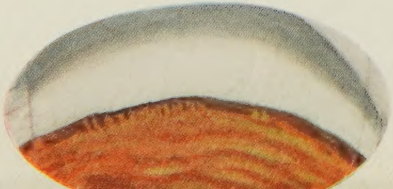
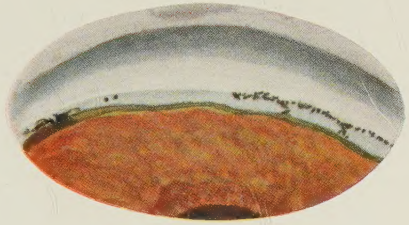


FIG. 8

FIG. 10

FIG. 9

FIG. 11



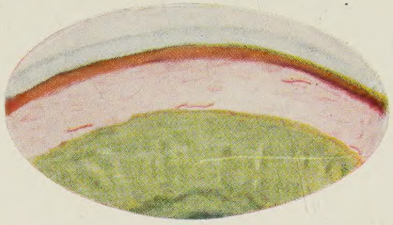


FIG. 12

Gonioscopy and its Clinical Applications.—Troncoso, page 17. (*Amer. Jour. Ophth.*)

Description of Plate II on preceding page.

The

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COMPRISING EIGHT VOLUMES ON THE YEAR'S PROGRESS IN MEDICINE AND SURGERY

Under the General Editorial Charge of

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Volume III

The Eye, Ear, Nose and Throat

EDITED BY

CHARLES P. SMALL, M.D.
ALBERT H. ANDREWS, M.D.
GEORGE E. SHAMBAUGH, M.D.

SERIES 1925

CHICAGO
THE YEAR BOOK PUBLISHERS
304 South Dearborn Street

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The Eye

CHARLES P. SMALL, M.D.

PUBLISHER'S NOTICE

We regret to announce that Dr. Casey A. Wood, for almost a quarter of a century the editor of the section on Ophthalmology, is relinquishing that office. Dr. Wood's resignation follows his retirement from all active practice in order to facilitate his researches in plant and bird life in foreign lands, a long cherished avocation.

With our heartiest good wishes for his new pursuits, we wish to express also the extreme regret with which we view his withdrawal and the deep sense of gratitude for his long years of faithful editorial service.

We have been particularly fortunate, however, in securing Dr. Charles P. Small as editor of this section of the Year Book. Dr. Small, instructor in Ophthalmology in the Chicago Policlinic and President of the Chicago Ophthalmological Society, has been Dr. Wood's associate and collaborator for the past five years and his professional standing is acknowledged throughout the field of his science. He brings with his unusual technical capabilities a thorough familiarity with the requirements of editorship, for both of which the excellence of the present work, we believe, is ample testimony.

THE YEAR BOOK PUBLISHERS.

THE EYE

More Recent Progress in Ophthalmology

Ophthalmic progress is taking two directions; the first leading to a better understanding of purely medical problems; the second leading to a better understanding of practical economic problems and of the patient as a human being.

Charles A. Bahn[1] draws attention to some of the more important phases of medical economics of interest to the medical profession in general. It is of interest here to record his views in respect to ophthalmic practice.

Refraction is fast slipping from the domain of medicine and only a much more aggressive policy on the part of the medical profession and ophthalmologists in particular can retain it.

Practical refraction requires in the vast majority of cases an intimate knowledge, not only of the visual apparatus but of the entire human body; in other words, to efficiently prescribe glasses usually necessitates an examination based on a thorough understanding of ailments of the eyes and ailments of the human being of which the eyes are a part. The knowledge we believe is, generally speaking, to be found only in those who have passed the accepted tests of medical fitness.

Ophthalmic Classification. Our classifications in ophthalmology are imperfect. We name similar conditions differently and very different conditions similarly. A

(1) New Orleans Med. and Surg. Jour., February, 1925.

system of classification and nomenclature based upon cause, as manifested by the characteristics of the tissue reactions, would simplify nomenclature and materially aid in the better understanding of processes, physiologic and pathologic.

Ophthalmic Diagnosis. The greatest recent advance in ophthalmic diagnosis is the adaptation of focal illumination, in the form of the slit light, to the Czapski corneal microscope.

Although at present clumsy, cumbersome and expensive, its use is helping to clarify our understanding of anterior ocular affections and in some instances to better determine progress, cause, and treatment.

With the present equipment at our disposal, the anterior ocular tissues can be practically studied with linear magnifications ranging from fifteen to one hundred; and with at least four forms of illumination, each having advantages and accentuating certain details.

These forms of illumination are essentially:

1. Focal refracted, in which a divergent or convergent beam, or an actual slit, is played upon the tissues, affording a rather accurate estimation of depth localization by means of the relation of a given point to the anterior and posterior surfaces which are seen as brilliantly illuminated rectangles.

2. Diffuse refracted, which roughly corresponds to ordinary daylight.

3. Focal reflected, in which the light is so angled that its reflection from the various ocular surfaces can be studied as ordinarily are the reflecting surfaces of lenses or mirrors.

4. Diffuse reflected, in which the light is reflected into the adjoining tissues, corresponding somewhat to transillumination.

In the cornea very small foreign bodies and rust spots can be identified, as can uveal involvement, through posterior surface opacities, and other finer

tissue details in the epithelium, Bowman's membranes, Stroma, Descemet's membrane and endothelium; in developmental and acquired conditions, often affording clues to process and cause. Of more academic interest are the nervous and vascular systems.

In the anterior chamber, slight differences of depth (lens sub-luxation); diminished size of the filtration angle (glaucoma); and very slight opacities, which appear as dust in a dark room crossed by a beam of light (uveal involvement) have a practical value. Rather interesting is the movement of opacities upward in the posterior portion and downward nearest the cornea.

The finer changes of size, shape and color seen in developmental and acquired affections of the iris include diffuse and focal, retinal and uveal, pigment proliferation, dispersion and absorption; stromal infiltration, cicatrization, and atrophy; and vascularization, both in and on the iris. The careful study of lens-iris adhesions often affords information of immediate practical service in treatment.

Six reflecting surfaces and at least that number of zones can be observed both in the anterior and posterior lens.

These zones are:

1. Central or embryonic, which forms before birth.
2. Intermediate or infantile nuclear, which forms during the first years of life.
3. Peripherial or adult nuclear, which forms during the remainder of life.
4. Transitional or cortical, which is undergoing transformation into nucleas during life.
5. Sub-capsular, which contains the newest formed lens fibers.
6. Capsular, covered by flat pavement cells.

The details of opacification as they involve these zones facilitate our understanding of the time of life when the opacity began and to a certain degree of its

progress and the best method of treatment. We can thus determine in the majority of cases whether or not an opacity is developmental or acquired, of physical or chemical origin, and due to the products of metabolism with or without the effects of pathogenic organisms.

Among the developmental affections of the lens which can be identified are: remains of the tunica vasculosa lentis; anterior and posterior; the hyaloid artery and attachments; the anterior more or less upright Y-shaped suture; the posterior inverted Y-shaped suture; punctate and linear deep cortical opacities, etc.

Post-traumatic opacities include: those with capsule rupture, concussion opacities which frequently begin in the posterior sub-capsular zone, and the anterior ring-shaped opacity of Vossius, which corresponds with the pupil and comparatively rapidly disappears.

Senile cataracts are apparently due to multiple factors, developmental and acquired (metabolic and possibly physical, such as heat, light, etc.). Depending upon the varying inter-relations of these factors, there are the different types of nuclear and cortical opacities.

Associated with intra-ocular disease, especially of the uveal and retinal tracts, lens opacities are frequent. These are the "complicated cataracts" and are especially important because they frequently occur in eyes potentially sightless, in which the removal of the lens will not improve vision.

These opacities begin in the sub-capsular zone, most frequently posterior, early in their development are rosette shape and located near the axis. They are characterized by their high degree of reflectibility, their porous character and by their rapid advance, usually forward.

One has not the right to operate upon a cataract

unless its type, development, traumatic senile complication, as well as its shape or zone involvement, are definitely understood.

In the anterior vitreous, congenital and acquired opacities can be differentiated, as can be those due to deposits, and those due to changes in the fundamental vitreous structure.

The red free light by which the color scheme of the fundus is changed from a pink, yellow, red to a green, yellow and black, enables us to determine more easily slight retinal caliber changes, hemorrhages, and certain changes in nerve structure, especially in the papillo-macular region.

The author has perfected a small portable combination ophthalmoscope, retinoscope, focal illuminator, slit light, operating lamp, and corneal microscope.

Surgical Treatment. The operation of phakoeresis, or removal of the lens by suction obtained from a small electrically driven pump has been successful in the hands of certain European operators, especially in uncomplicated immature cortical senile cataracts, but whether or not it is adapted for our use remains to be seen.

The intra-capsular extraction of cataract especially with the Smith technic is apparently much less hazardous in India than in this country, probably due to both the lens and the individual being there exposed to a very hot climate and a very bright light.

The innumerable modifications of the operative treatment of senile cataract which have been suggested, and which have been tried and discarded in the court of general usage, only serves to emphasize that to the present time the accepted combined extraction is for the vast majority, the best and simplest method of treatment in uncomplicated senile cataracts.

Generally speaking, the Elliot operation seems to be the operation of choice in non-congestive glaucoma, and the sclero-iridectomy in the congestive form.

The anesthetic injections of the orbital apex in intra-

ocular operations, as well as the injection of the peripheral facial nerve or the operation of canthotomy to prevent forcible contraction of the orbicularis, are most valuable adjuncts to intra-ocular surgery. We routinely inject about one-half c.c. of a 2 per cent. novocain solution, with two drops of adrenalin, practically at the apex of the orbit with a two inch needle, entered at the lower temporal equator of the eye ball. This location is selected because of the absence of extra-ocular muscles and because the nasal branch of the fifth enters the orbit through the lower portion of the spheniodal fissure. Usually within a moment, the pupil dilates, showing that, probably through the sympathetic dilator function indirectly the intra-ocular portion of the fifth nerve has been anesthetized.

Butyn as a local anesthetic in the conjunctival sac, apparently insensatizes the tissues, with the same intensity as cocain, but does not destroy the epithelium as rapidly as the older drug.

Medical Treatment. The use of nonspecific protein therapy is still experimental which means that we do not know its exact action, uses or dosage, although in gonorrheal ophthalmia it has become a part of our routine treatment.

In the treatment of dacryocystitis and trachoma the tendency appears toward nonsurgical methods. With the possible exception of mercury and certain coal tar derivatives in staphylococcus and streptococcus infections, optochin in pneumococcus, zinc in diplobacillus, and silver in gonococcus infections we have no conjunctival antiseptics of specific value. Borax, boric acid, potassium permanganate and the legion of other solutions which have been, and probably will be used in eyes as long as time lasts, are in the proper dilution non-irritating, and isotonic with the tears, but do not have any curative action except in the removal of secretion which may be chemically irritating. Aqueous solutions in the inflamed conjunctiva are diluted to at least one-

twentieth of their original strength within five minutes, which means that even assuming a bacteriacidal action in normal strength, which is far from proven in most instances, homeopathic dilutions soon result which could not possibly have specific curative value.

Radium and *x*-ray therapy are still experimental and generally reserved for inoperable cases.

Tuberculin therapy has been more widely adopted in ophthalmology than in other medical branches, possibly because the local reaction can be better studied and regulated in the eye than elsewhere. The objection to its use is in the general reaction that may unfavorably affect the patient's bodily health, and even life.

Light therapy affords a local without a general reaction and seems to offer certain advantages as an adjunct in the treatment of ocular tuberculosis.

Endocrinology has thus far been of greater value in the understanding of developmental and metabolic problems than as a direct means of specific medication. With the exception of the thyroid, the pancreas, adrenals, and the pituitary, the active principles of the ductless glands have not been isolated, which practically means that for the most part, specific endocrine therapy is of more value in the experimental laboratory than in the physician's everyday practice.

Examination of the Eye

Gonioscopy and Its Clinical Applications. The gonioscope here described is adapted to examine all parts of the angle of the anterior chamber in all eyes. The appearances it reveals in the normal eye are described including the iris, ciliary body, sclerocorneal junction, inner surface of cornea and limbus and the pupil. Cases are reported illustrating pathologic conditions of pigmentation, high myopia, atrophy of iris and ciliary body and ciliary processes, iritis, glaucoma.

and following operations involving the iris and chamber angle.

The examination of the angle of the anterior chamber, or gonioscopy as described by M. Uribe Troncoso,[2] deserves a place in the routine examination of the eyeball, after the ophthalmoscope and the tonometer. The region of the angle normally invisible by the opacity of the scleral limbus, is easily observed with the new contact glasses of Salzmann and Koeppe. (Fig. 1.) Both

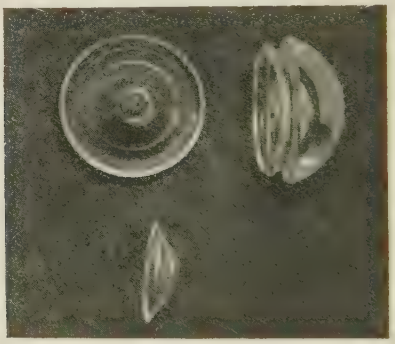


Fig. 1.—Above: Front and side view of Koeppe's contact glass. Below: Side view of Salzmann contact glass. (About three-fourths natural size.)

of them can be used with the electric ophthalmoscope, inserting a +20 lens behind the aperture, giving good views. However, with this method the nasal part of the angle is the only region readily accessible. The shape of the ophthalmoscope makes its use difficult above the nose for the inspection of the temporal side of the angle, and above and below the orbit for the opposite sides of the angle.

The magnification obtained with the Koeppe contact glass is small (3 diameters) and generally insufficient to detect minute pathologic changes. The Salzmann glass gives much larger magnifications and excellent views with a deep anterior chamber, but when this is

(2) Amer. Jour. Ophth., June, 1925.

shallow the field is greatly obstructed by the lesser circle of the iris; the observer's line of vision being confined to a plane strictly tangent to the iris. As the illuminating beam and the image forming rays follow the same path, they interfere with each other and the image is not free from fog (Koeppe). With Koeppe's contact glass a perfect, clear view of the angle is obtained in a panoramic way, even with a flash light. In the optical zone the path of the incoming and emergent rays is different, and the spherical aberration considerably less.

With the slit lamp and the Koeppe glass magnifications as large as 40 diameters can be obtained. Unfortunately the technic is long, difficult, and needs considerable practice. Moreover the nasal and temporal sides of the angle are only available to observation.

Hoping to obtain a clear, unobstructed view of the angle in all directions and a sufficient magnification, the author has devised and perfected a new instrument, the gonioscope, which is a microscope and a periscope combined. It has been built by Bausch & Lomb Optical Co. with great care and accuracy. (Fig. 2.)

The tube of the microscope CA has a length of 0.23 cm. and revolves around its axis inside of a looped band D which is attached to the handle of the instrument, J. The handle is at right angles to the tube. Inside of this handle a sufficient space for a dry battery has been reserved. One end of the tube is conical and carries the objective lens and a square prism, A, through which the rays of light coming from the angle and parallel to the surface of the iris, are totally reflected and sent to the optical system in the tube, allowing the observer to place himself in front of the patient. Two interchangeable eye pieces give magnifications of 10 and 20 diameters. The rotation of the microscope tube around the eye brings into view the structures of the angle all around the limbus. This periscope arrangement gives the observer a much more comfortable position than the lateral view which the use of the ophthalmoscope entails.

Fig. 2.—Side view of the goniscope. CA, tube of the microscope ending in the square prism A. FB, tube carrying the lamp at L and ending in the square prism B. G, screw for moving the lamp inside the tube. F, shaft for keeping the electric contact when the microscope revolves around the ring D. E, screw for fixing the tubes in position. K, rheostat controlling the amount of illumination from the battery J. H, high power ocular.

The illumination of the angle is made by a small electric lamp, L, carried in a tube and fastened alongside the conical end of the microscope. The lamp is provided with a condensing lens and the rays of light are sent at right angles to the tube by means of a square prism, B, parallel and on the same level with the square prism of the microscope.

In order to keep the electric contact when the gonioscope revolves, the tip of the lamp carrying shaft, F, slides around a metallic plate connected with the dry battery.

Focusing was at first made by changing the distance between the objective and ocular, but it soon was found that the slight movements transmitted to the instrument by sliding the ocular piece, caused a change in the place spotted and a blurring of the image, due to the displacement of the microscope. It then was decided to have the ocular and object lens stationary, and regulate the focussing by approaching or separating the tip of the gonioscope from the eye.

A stationary instrument was not considered, the purpose being to devise a practical portable instrument, with the same advantages as the ordinary electric ophthalmoscope.

The gonioscope could have been made lighter by using a smaller dry battery, but the illumination required in the angle being necessarily strong, since a great amount of rays are lost by reflection and by refraction through the contact glass, a heavier battery was important.

The gonioscope, like the ophthalmoscope, requires a complete training for obtaining: first, a clear, sharp view of the angle; second, for recognizing the different structures, their places, positions and variations, and third for correctly interpreting the pathologic changes. Therefore it is necessary to be perfectly acquainted with the physiologic angle and its anomalies, before venturing on the detection of disease.

The Contact Glass. Prior to describing the technic of

the gonioscope itself, some explanation of the application of the contact glass will be useful. The Koeppe contact glass is the only one which can be used with the gonioscope, the Salzmann glass not being suitable for focal illumination. The Koeppe glass is more conveniently applied with the patient lying on his back. In this position it is easier to fill the chamber with saline solution, and there is less danger that the glass may slide and be broken on the floor; a loss to be considered, because the contact glasses are quite expensive.

Two or three drops of holocain in 1 per cent. solution, are instilled. The glass is held between the thumb and index finger of the left hand and the patient instructed to look down; then the glass is inserted below the upper lid, whose edge must exactly fit into the groove at the periphery of the glass. The patient is then directed to look straight up and the glass is pushed below the lower lid, which the right thumb separates from the eye and aids to fit into the corresponding groove. There remains now between the cornea and the glass a space which should be filled with physiologic salt solution. The author uses a dropper with a flattened end, or an ear rubber syringe, whose tip is inserted below the border of the glass, which the thumb and index of the left hand have not abandoned.

To facilitate this maneuver the head of the patient is tilted toward his right when the right eye is examined, and toward the left when the left eye is examined. Gently lifting the glass in its inner nasal border with the fingers, by a pressure of the rubber bulb with the right hand the liquid is injected into the chamber, taking good care that the air bubbles are thoroughly expelled. This somewhat difficult task is easily accomplished by the lateral position of the cornea and contact glass, which the turning of the head has brought about. As soon as the air is wholly expelled the head is turned to its former position, and the glass gently pressed upon the eyeball to obtain a perfect adhesion of its borders.

It is very important to keep it in the same position, always parallel to the cornea, as any slight lateral movement will give entrance to an air bubble and require a new turning of the head and refilling of the chamber, with the corresponding loss of time.

For the fixation of the glass Koeppe uses a strip of bandage tied around the head and provided with a knot which fits into the central hole. This method, perhaps convenient for the slit lamp where the illumination is projected in a lateral way only, can not be employed with the gonioscope, in which the examination is made all around the limbus. Instead of the bandage, the author has devised a head band which bears in the center a horizontal bar on which a carrier with a movable arm and a shaft ending in a ball can be slid over each eye. The ball fits into the hole of the contact glass and presses it down evenly, keeping the edges in contact with the sclera and avoiding the entrance of air bubbles. The carrier is fastened to the bar with a screw.

Using the Gonioscope. The gonioscope firmly held with the right hand, is placed in a position opposite to the part to be explored. The tip of the instrument is held between the thumb and index of the left hand, the three other fingers resting upon the temple of the patient and firmly supporting the instrument.

Before looking into the microscope it is advisable to direct the beam of light on a plane parallel to the surface of the iris, which will be brilliantly illuminated. Even with the naked eye it is then possible to observe through the contact glass the inner part of the sclera and the root of the iris, slightly magnified. Placing now his eye on the microscope, the observer sees a blurred image of the angle which is brought to a sharp focus by slight movements to and from the angle, until a bright, perfectly defined image is obtained. The focal distance is about 30 mm. for both 10 and 20 magnifications.

The tip of the instrument is placed at this distance from the contact glass, and the fingers steadied on the temple for the examination of the nasal part of the angle of the right eye. For the temporal side the tip of the gonioscope is rotated with the fingers and held near the side of the nose, the supporting fingers of the left hand stretching above the contact glass and moving the instrument back and forth to a fine adjustment. For the upper angle the tip is placed near the cheek, and for the lower part of the angle above the forehead, always supported by the left hand, the observer keeping the same position at the side of the patient.

For the left eye either the gonioscope is held with the left hand and the tip of the instrument is supported by the thumb and index of the right hand, or the gonioscope is held with the right hand and the observer moves himself to a position perpendicular, instead of alongside the patient's body, and rotates the microscope accordingly.

The tube of the microscope should be at a right angle with the face for the examination in a plane parallel to the iris, but when a view of the ciliary body in the recess of the chamber is desired, the ocular end of the tube should be tilted toward the side of the observed angle. Some practice is required for getting and keeping in view the different structures; but once this is acquired the examination is easier and rapid.

In order to get accustomed to the different steps of the method, especially for focussing, it is advisable to paste a small band of paper containing one or two words printed in very small type inside of the contact glass, immediately below the projecting rim into which the superior or corneal curvature ends. The contact glass is then placed upon a table, and the gonioscope tried until a clear image of the letters is possible. It will be noticed that this image is inverted in a lateral direction, but not up and down.

The gonioscope has the great advantage of giving a view of the angle not only in a plane parallel to the iris, but slightly elevated. By moving the instrument upwards the line of vision reaches the innermost recesses of the angle, exposing the whole surface of the ciliary body. This can not be accomplished with Salzmann's contact glass and the ophthalmoscope, the line of vision being always parallel to the iris.

The higher magnification of the gonioscope must be reserved for special cases. It requires a strong illumination with a fresh battery, and the field is smaller.

The Normal Angle. The principal landmarks in the picture of the angle are the pupil on one side and the cornea on the other. In order to orientate himself, the observer should undertake the examination in a systematic way as follows (Frontispiece, Plate I):

1st. The pupillary zone of the iris.

2nd. The surface of the iris.

3rd. The ciliary border or visible limit of the iris.

4th. The ciliary body.

5th. The sclerocorneal trabeculum (ligamentum pectinatum), covering the Schlemm canal (zone of Schlemm).

6th. The inner part of the scleral limbus.

7th. The inner concave dome of the cornea.

8th. The optical section of the cornea.

1. The pupil appears nearly in half, its size increasing or decreasing with the position of the instrument. Beyond the pupil we find: 1st, a colored, abruptly rising slope, the pupillary zone of iris, bound by a more or less elevated, wavy ridge; the lesser circle. In the surface of this zone and sometimes also in the outer edge of the ridge, dark, pitlike depressions, the pupillary crypts, are clearly visible (Frontispiece, Plate II, Nos. 5 and 7).

2. The radiating markings of the iris are rarely to be seen (No. 5), but the contraction folds in the periphery are clearly outlined, the elevated portions of the

folds being darker in color and the furrows lighter. The peripheral crypts described by Fuchs are often visible, particularly in light iris. (No. 5.)

3. Farther away the iris ends in a sharp wavy line, the ciliary border for last roll of the iris. In it and on the adjacent surface of the iris there are often straight, indented elevations, the iris processes described by Salzmann (i. pr.) (Nos. 5, 7, 8). With the Koeppe glass these iris spurs are only visible when they arise near the ciliary border, because the iris surface is seen a little from above. With the Salzmann glass, on the other hand, they are very apparent, the line of vision being tangent to the iris; which makes every relief in the membrane appear very distinct.

4. As the semischematic section (Plate I) clearly shows, the root of the iris is not inserted directly to the sclera but to the anterior and inner part of the ciliary body, which really forms the angle of the anterior chamber. The ciliary body appears in the picture as a narrow dark gray, light dark brown zone immediately bordering the iris; its color changing according to the color of the iris and the complexion of the patient. Its structure is homogeneous or with some striations. The breadth may be uniform or change in different parts of the angle (CB—Plates I and II, Nos. 5, 6, 8, 11.) By slightly lifting and tilting the gonioscope it is possible to examine this dark concave sinus, which lies in a deeper plane than the iris, and whose outer limit rises to meet the sclera. The ciliary body becomes inserted by a straight way, slightly irregular or indistinct border. (Nos. 5, 6, 7, and 11). The contrast between the dark brown color of the ciliary body and the bright sclera is always striking.

In young normal eyes the ciliary body is easily seen. In old persons, however, the anterior chamber may be so shallow, by the elevation of the lesser circle and border of the iris, that it becomes partly or totally invisible. In this case it can only be detected after the use

of eserin. (Nos. 10 before, and 11 after eserin.) When iris processes exist in the ciliary border of the iris they may conceal in part the ciliary body, as in No. 8. In some cases the ciliary body is limited anteriorly by a narrow brilliant white line which corresponds to the scleral spur.

5. Next to the ciliary body there is generally a grayish or grayish pink band, about 2 mm. wide, and broader than the ciliary body. (Nos. 5, 6, and 11.) This is the sclerocorneal trabeculum or ligamentum pectinatum, which covers the Schlemm canal and is made of a close network of interlacing fibers. Its outer border is in some eyes clear cut and sharply limited from the white sclera (Nos. 5, 6, 11) or it may be bordered by a narrow, brilliant white line (No. 6). Sometimes it is indistinct and blends gradually into the sclera. Very often this grayish stripe, which may be called the Schlemm zone to indicate its position, does not exist, and the white sclera begins immediately outside the ciliary body.

In some of the normal eyes, especially when congested, one or two bright red, narrow lines, appear bordering the Schlemm zone on either side. (No. 8.) They are more conspicuous with the high power ocular, and are due to a small amount of blood circulating inside of the Schlemm canal; the blood collecting near the walls.

6. The white zone is the last region of the angle proper and corresponds to the inner part of the sclera and the sclerocorneal junction. Its width is generally double or triple that of the Schlemm zone. It varies with the position of the gonioscope appearing large when the line of vision remains parallel to the iris surface (No. 7), and shorter when the instrument is raised, especially if the anterior chamber is shallow. (No. 11.) As the width of the scleral zone is of importance in pathologic conditions (glaucoma), it is necessary to

familiarize oneself with its relative size in normal eyes, under varying conditions.

This white zone is limited in the upper part by an indistinct border formed by the bias of the edge of the sclera as seen through the transparent cornea, which it overlaps exteriorly. This ill defined, veiled border is curved in a low arch whose apex is always in the center of the gonioscopic field. In some patients numerous meridional fine vessels can be seen in this border branching toward the cornea. They have been observed by Koeppe with the slit lamp. He considers them as the last scleral branches of the rami recurrentes anteriores of the anterior ciliary vessels; but warns against mistaking them for the external limbus capillary loops, which are occasionally visible through the whole corneal thickness.

7. The inner surface of the cornea appears as a transparent, bluish or grayish crescent, blending gradually with the white sclera in its inner side and sharply limited outside by the:

8. Optical section of the cornea. The observer has an illusion of seeing a microscopic section of the cornea, whereas in reality he is looking through the thickness of the convex border of the membrane.

Outside of the cornea the contact glass appears as a colored, pinkish or brownish crescent, with indistinct shadows and colors.

The Ciliary Process and the Ora Serrata. In patients suffering with irideremia or after an iridectomy, the ciliary processes and the region beyond, to the ora serrata, become perfectly visible with the gonioscope. The processes are seen not entirely in front but from a lower plane, their tips and the inner surface of the *pars ciliaris retinae* being easily followed to the *ora serrata*. No. 9 shows the normal ciliary processes in a case of intra-ocular foreign body, for whose extraction an iridectomy was done. The processes are long, straight prolongations of different shapes and breadths, club like,

curved at the base, or branching like an inverted "y." The color is dark yellow, the prominences being lighter. They are widely separated by dark brown interspaces. Below the line of processes the orbiculus ciliaris is visible as a narrow black zone ending abruptly in a jagged line, the ora serrata.

In pathologic conditions, the size, shape and color of the processes change. They may look like teeth, rounded or pointed in its lower part, where they are widely separated from each other, or they may be triangular, quadrangular or tongue like. Sometimes one, two or three rows of processes can be detected, some being merely small plica ciliaris. Generally from five to seven are visible in the coloboma.

The gonioscopic appearances of various pathologic conditions are described and illustrated, and in addition to these cases, the gonioscope has been used in many others where changes have been produced in the structures of the angle. It gives valuable data in injuries, especially iridodialysis an inversion of the iris. In a case of congenital irideremia the gonioscope was of use for determining the total absence of this membrane and the condition of the ciliary processes. In buphthalmus the detection of peripheral synechia is of importance for selecting the proper operation.

The examination of the angle in leucoma adherens with anterior synechia, shows the place and extent of the peripheral adhesion. Tumors of the ciliary body, gummata and tubercles can be detected in an early period of its development.

Photographing the Human Fundus. The photography of the fundus naturally followed the invention of the ophthalmoscope. The substituting, however, of the observer's eye with an inanimate apparatus presented many almost insurmountable difficulties. The conquering of these difficulties, one after another, as represented in this fundus photography, will always remain a monument to the patient and painstaking work of Hofrat

Professor Dimmer, of the University Eye Clinic II, in Vienna.

When there last summer, W. O. Bell[3] was glad to find that his work had been recognized by the Rockefeller Foundation. They furnished the funds for the construction, by Zeiss, of his new apparatus, the one which is now in use in Eye Clinic II.

An explanation of the apparatus is necessary in order to understand its construction and operation. A picture of the older apparatus, containing the essentials of the newer model is here substituted.

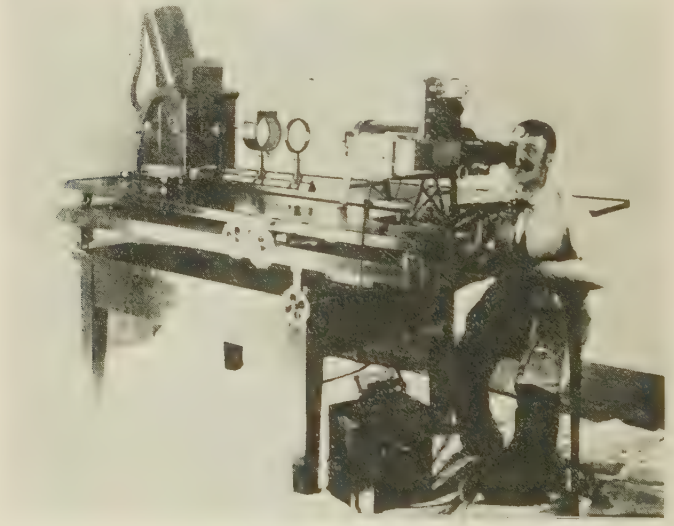


Fig. 3.—The Dimmer fundus camera.

In the lamp house is the source of illumination, a 220 volt arc lamp. The light is passed through a water filter to remove the heat. Beyond the filter is a ring, across which is stretched a thin wire. This carries a small ball, to be used as a fixation point for the eye which is to be photographed. Beyond is the camera itself (Fig. 3).

(3) Northwest Med., January, 1925.

The three large wheels at the side of the table move the whole apparatus up or down, right or left, or closer to or farther from the eye to be photographed. If the latter is incapable of fixing, then the other eye fixes on the image of a miniature red lamp, seen in a small mirror placed in front of the second eye.

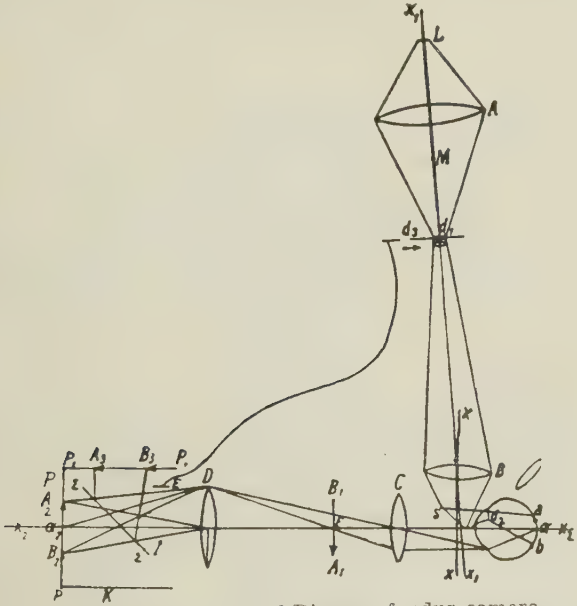


Fig. 4.—Diagram of Dimmer fundus camera.

The principles of the apparatus follow (Fig. 4): L is the arc lamp, A a large condenser lens, which gives an image of L in d_1. d_1 is a hole in a diaphragm covered by a dark London smoke-glass, so that the apparatus can be focused without admitting unnecessary light to the fundus. From d_1 the rays of light go to a second lens B, which produces again an image of L. Before this image is produced, the rays are deflected by a small mirror S, so that the last image of L is formed in the pupil of the eye in d_2. The rays then diverge in the eye and a large area, ab of the fundus, is illuminated.

The rays from the area ab pass through the lower half of the pupil to an objective lens C. By this is formed an inverted image of ab in A_1B_1. From here the rays diverge and find their way to a second objective D. This objective contains in itself a diaphragm, the shape of a crescent, covering the lower half of D. This diaphragm shuts out all the rays which come out of the upper half of the pupil, and prevents their reaching the photographic plate. In this manner is produced a reflexless image. This principle was subsequently used by Gullstrand in his large, reflexless ophthalmoscope.

From D the rays go to an oblique mirror E E which deflects the light so that the image of the fundus is formed on the focusing glass P_1P_1 in A_2B_2. At the instant that the focusing is completed, the operator presses a button which causes the mirror E E to swing up in the direction of the arrow, and out of the way of the rays of the photographic plate in A_2B_2. In this position the mirror E E touches a switch E, causing an electric current to move the diaphragm d_1d_3 in the direction of the arrow, and, instead of the hole d_2 covered with the gray glass, there is an open diaphragm, which allows the full rays of the electric arc to illuminate the field for 1/7 of a second.

The size of the original negative is 40 mm., and the magnification of the fundus equals five to six times. The area covered is five to six disc diameters. Isochromatic plates are used. The patient holds his head in position by biting into a mass of dental composition, while it is warm. The dental composition covers an iron support. (Plate III.)

The Practical Value of the Slit-Lamp. T. Harrison Butler[4] gives the following concise resumé of the method of using the Gullstrand slit-lamp and shows the appearances of the various structures of the eye, as seen by this method of examination.

The advantages conferred by the slit-lamp are not

(4) Brit. Med. Jour., May 31, 1924.

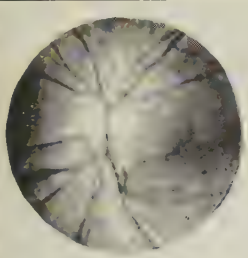


FIG. 1

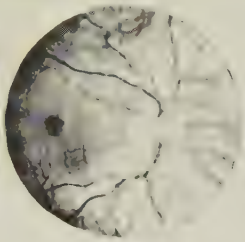


FIG. 2

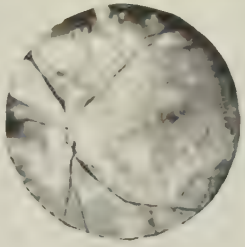


FIG. 3

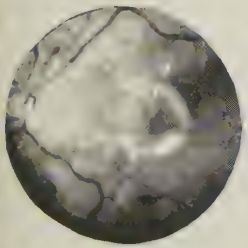


FIG. 4

FIG. 5

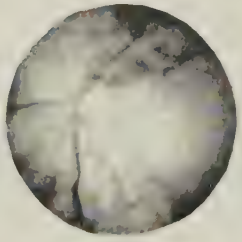


FIG. 6

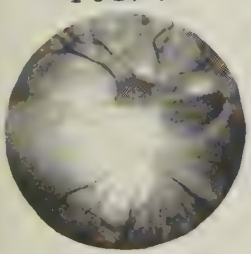


FIG. 7

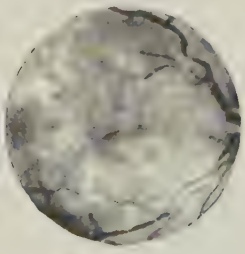


FIG. 8

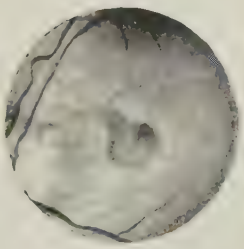


FIG. 9

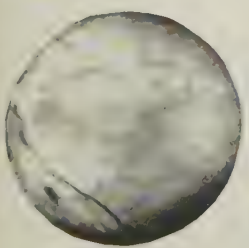


FIG. 10

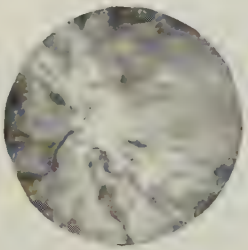


FIG. 11

FIG. 12

Description of Plate III on following page.

DESCRIPTION OF PLATE III.

1—Normal fundus. Man, aged 22 years.

2—Temporal conus. Visible vessels of the choroid, cilio-retinal vessel. Boy of 15 years. Myopia 7 D. Vision 6/8.

3—Choroiditis desseminata. Woman 34 years old. Left eye. Vision 6/18. Etiology probably tuberculosis.

4—Retinitis albuminurica. Woman 49 years old. Left eye. Vision 6/24. Partly stellate, partly ring-shaped degeneration in the macula. A few hemorrhages present.

5—Choked disc. Woman aged 47 years. Swelling of the disc 3 D. Left eye. Hemorrhages and white spots in the retina. Etiology lues cerebri.

6—Hemorrhages in the retina. Patient 67 years old.

7—Preretinal hemorrhages. Male, 55 years old. Near the nasal margin of the disc; retinal hemorrhage near the upper margin of the disc; small hemorrhages farther off in upper part of the retina. Left eye. Vision with -4 is 6/8.

8—Chorioretinitis tuberculosa. The right eye of a girl of 22 years. Vision 6/36.

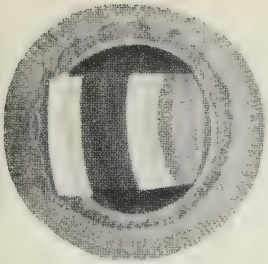
9—Hemorrhage in the region of the macula. Left eye. Man, aged 53 years. Vision 6/60.

10—Retinitis albuminurica. Woman 51 years old. Right eye. Hemorrhages in the retina, especially near the disc; white spots in the region of the macula and above. Vision equalled fingers at 2 M.

11—Phlebitis retinalis. Woman of 45 years. Left eye. Thrombosis of the central vein in the inferior part of the fundus. Hemorrhages in the retina, dilation of the veins. Vision 6/24.

12—Phlebitis retinalis. The same eye two weeks later. Bell, page 29.

PLATE IV.



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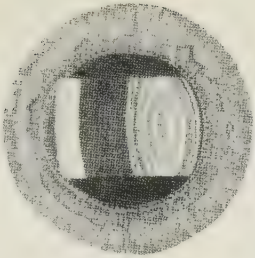

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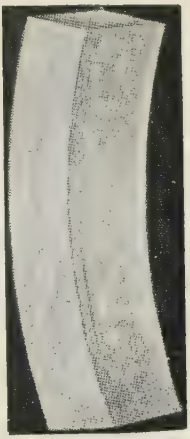

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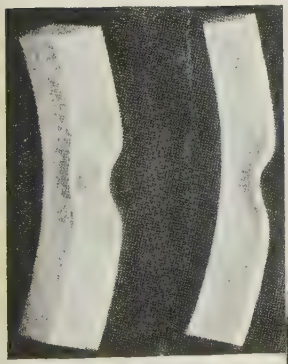

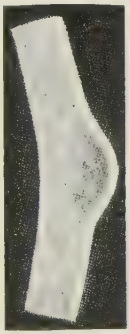

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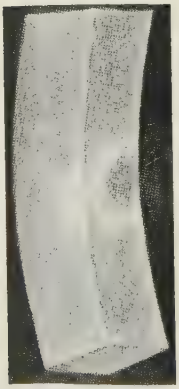

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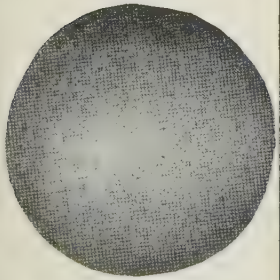

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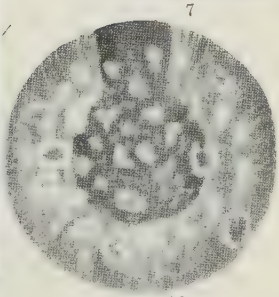

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The Practical Value of the Slit-Lamp.—Butler, page 32.

PLATE V.

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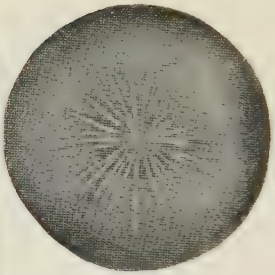

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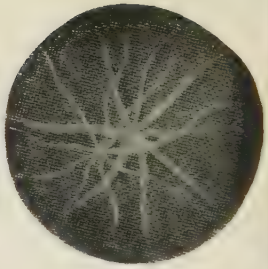

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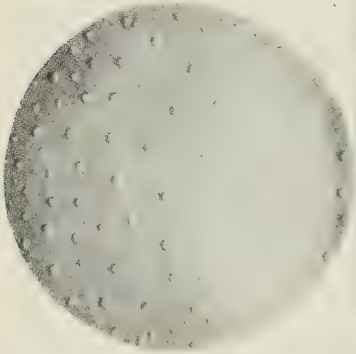

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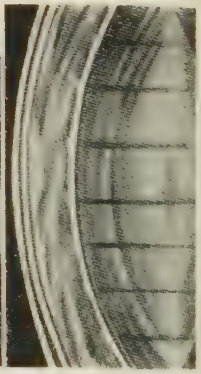

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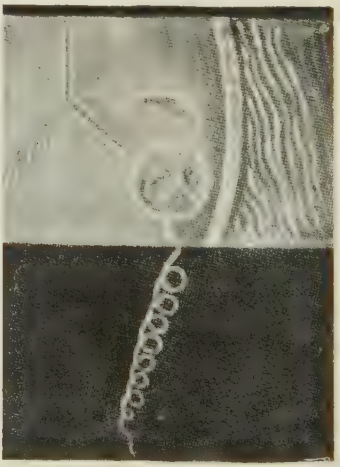

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The Practical Value of the Slit-Lamp.—Butler, page 32.

only those inherent in itself, but also greater efficiency in the use of the older methods. This is due to two factors: we can to some extent apply slit-lamp technic to the ordinary oblique illumination with simple lens and condensing lens; and secondly, when we have become accustomed to the aspects of the cornea, the anterior chamber, the lens, and the vitreous, under the high magnification of the eye microscope and the focal illumination of the slit-lamp beam, we are better able to interpret the same subject seen with the smaller magnification of the loup, which in general magnifies about six times.

If, instead of using for oblique illumination the ordinary frosted bulb, we employ a 40-candle-power gas-filled half-watt lamp, or even a more powerful one at a considerable distance, we can apply the principle of focal illumination. We can make a ray of light pass into the eye and note that the cornea is illuminated, the anterior chamber dark, and the lens bright, and in the case of lens sclerosis we can even make out that the lens shows dissociation areas—that is, is laminated. If we make the patient fix his gaze between the light and our lens we can see the lens shagreen, and can make out the sutures of the surface of the lens cortex just below the capsule. If we move the shaft of light from side to side and note when any given opacity lights up, we can locate its position along the shaft of light, and so form a fairly accurate estimation of its exact place in the lens. We can direct our pencil of light upon the iris, and see the cornea by reflected light, by retro-illumination; and by throwing the beam into the lens we examine the iris in lens light and make evident atrophic areas in the pigment layer of the iris, especially in the region of the pupil margin, the *collerette* of the French.

In a case of interstitial keratitis the blood column is seen to be segmented in the smaller vessels, and

the position of the segments slowly moves, whereas in a larger vein the actual blood stream can be perceived, the contents of the vessel becoming moniliform and streaming along rapidly. In fact, the slit-lamp picture is reproduced. To see the bloodstream with a simple lens it is essential to secure full dark adaptation and so to direct a strong beam that the light is reflected back from the iris and traverses the vessel. Finally, using a point of light lamp, it is possible to see the actual circulation of the blood in the limbal vessels of a normal eye. In this case the beam was accurately focused upon the sclera in such wise that it was reflected back through the conjunctival vessels. Under suitable conditions it is not difficult to see the vitreous fibrils with the simple lens.

Familiarity with the slit-lamp thus increases our efficiency with the older instruments.

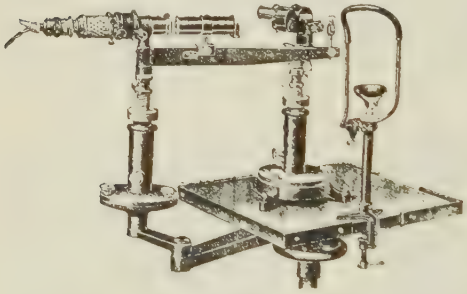


Fig. 5.

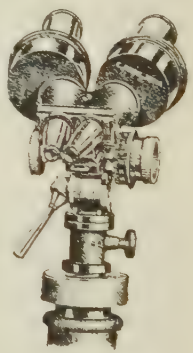


Fig. 6.

Fig. 5.—The corneal microscope and Gullstrand's slit-lamp.
Fig. 6.—Microscope head with Ulbrich's graduated drum attached.

The slit-lamp and corneal microscope are shown in Figures 5 and 6. The light source is a nitra-lamp with a thick helical filament. The light is projected by a lens system through a slit which is capable of adjustment to furnish a wide or narrow beam of light. The image of the filament is projected upon an illu-

minating lens which moves along a radial arm by means of a rack-and-pinion motion. This allows the beam to be brought to an exact focus. The lamp can be raised or lowered by a spring-balanced screw, and the radial arm moves freely from side to side. The whole is attached to a table by a double arm designed by Henker. The table has a polished glass top upon which the microscope slides freely. As an alternative the microscope can be mounted upon a double slide like a large mechanical stage. Probably the glass top is the best in the hands of an expert. The microscope, shown in Fig. 6, was invented by Czapski, and as now made by Zeiss is an adaptation of their well known prismatic dissecting microscope. It is capable of magnifications ranging from 9 to 108. A chin and forehead rest is attached to the table. Both table, chin rest, and microscope have a similar screw adjustment to the slit-lamp, which allows the patient to rest his head comfortably and the surgeon to direct the beam of light to any part of the eye at will. It is essential to have the correct instrument.

The illuminating lens should, for ordinary clinical work, be the small Vogt lens with a focal length of 10 cm. The larger aspherical lens is not achromatic, and does not give quite the same definition of the corneal prism and of other structures. On the other hand, it collects more light, and in consequence is better for the examination of the vitreous.

The examination should be made in complete darkness, and the more difficult subjects will be appreciated only when the eye becomes dark-adapted. It is not desirable to take the patient to the dark-room, look at his eye with the slit-lamp, and then return to work which demands light adaptation. It is better to examine the patients in batches if the best observations are to be made. Dark adaptation is especially necessary in the search for cellular elements in the aqueous. It is important that the microscope be accu-

rately adjusted for the observer's intrapupillary distance. The slightest error here will disturb the stereoscopic effect and produce eyestrain. Very often the merest touch will produce the desired effect. There is little or no discomfort involved in the examination; the majority of patients will tolerate prolonged sittings even when suffering from inflammatory states, but some have a definite time limit in this respect. If we are working with the narrow slit the patient is almost unconscious of the light. Quite young children make excellent subjects. The pupil does not contract much under the slit-lamp, and most observations can be made without any mydriatic. A complete examination of the lens and vitreous calls for a dilated pupil, but in general we can learn all that we require with a normal pupil.

Practice should begin upon pigs' eyes and continue upon the human eye. If, however, it is not possible to attend a suitable course, such as Professor Vogt's at Zürich, much may be done by reading up the subject, but unfortunately all the important literature is in German. There is a little in French, and a few articles will be found in American journals. Localization is ably dealt with by Vogt in a paper translated in the *British Journal of Ophthalmology* for March, 1924. *Atlas of Slit-Lamp Microscopy* has been translated into English. Koeppe's valuable work on "*The Microscopy of the Living Eye*" is a book which is absolutely necessary if we are interested in the microscopical side of the study, as it deals largely with appearances seen under magnifications of 60 and over. Gallimerts and Kleefeld have published an interesting series of articles in the *Annales d'Oculistique* for 1919 and 1920. They are well illustrated, but are somewhat out of date, and as regards the lens wholly so. There are many valuable and magnificently illustrated articles by Vogt in the *Archives of Ophthalmology* for the past eight years.

The slit-lamp in no wise supersedes our older technic.

It supplements and amplifies it. When we have done all that we can with ophthalmoscope and simple lens we can carry our investigation much further, with the result that much that was problematical becomes clear: we can pass from what was often at best good guessing to certainty.

When the broad beam of the slit-lamp is focused upon the eye it first illuminates the cornea, producing a prism of light. The anterior chamber remains dark under normal conditions. The lens becomes illuminated, and behind it the vitreous fibrils can be brought into focus. When the slit is narrowed down the prism becomes a mere illuminated slice of the tissue under focus; we have in effect an optical section. The appearances presented are seen in Plate IV, 1 and 2. The first shows the effect with a broad ribbon of light, the second with a narrow beam.

We can now proceed to examine the structures of the eye in detail.

Cornea. When the broad beam is focused upon the cornea we have, as already stated, a belt of illuminated tissue which may be regarded as a curved prism; No. 3 shows this prism magnified 35 times. It will be noted that it has two easily visible sides and three edges. In the young and normal cornea the fourth edge is difficult to see, but careful focusing will reveal it. It is faintly shown in the drawing. The light must be imagined to come from the left side. The left-hand surface is the direct reflection from the corneal surface; we can call it the epithelial surface. If a drop of cocain be instilled, followed by another of fluorescein, the epithelial surface will be easily differentiated, for the fluid upon it will be stained green. The right-hand surface seen in the drawing is the section of the cornea. The prism has two more sides—the endothelial, and the lateral section which is not in view. It is quite obvious that observation of the section side will enable us to judge with reason-

able accuracy the position of an opacity or structure in the cornea. We can say that it is on the epithelial surface, within the substance of the cornea, or on the endothelial surface. We can move our prism from side to side and trace out the configuration and position of the subject in question. The exact method of accurate localization is described by Vogt in the paper already mentioned.

If we now narrow down our beam of light we can almost abolish the epithelial and endothelial surfaces and work with a pure section. This section gives a clear indication of any irregularity in the corneal surface or marked change in its curvature. No. 4 shows the effect produced by a corneal ulcer; No. 5, the heaping up of tissue which has followed the healing of an ulcer. No. 6 is the section of a conical cornea; the thinning of the apex is well demonstrated. The white lines like threads of cotton crossing the prism in No. 3 are the corneal nerves. These never penetrate into the deeper lamellae.

If, when examining a case, we make the patient fix his gaze half-way between the axes of the lamp and microscope, we can examine structures close to the reflected light, in specular or mirror light. By this method we are able to see the endothelial cells of the cornea. They form a hexagonal mosaic of a yellowish tint. They are shown in No. 7.

The slit-lamp is of great service in the case of foreign bodies embedded in the cornea. It is valuable to know exactly how deep they have penetrated and how they lie. With this knowledge we can plan the method of extraction and remove them with the least damage to the cornea. When there is a history that an eye has been struck by a flying fragment of metal, we can determine whether the cornea has been actually penetrated.

Many diseases cause profound changes in the appearances of the cornea. Nos. 8 and 9 are taken from

a case of herpes ophthalmica. No. 8 is the view with the simple lens; it shows keratitic precipitates (K.P.) and a fine striation in the lower segment. No. 9 shows the appearance of these striations in the corneal prism, magnified 35 times. It will be noted that the white punctate deposits are quite superficial in the prism. Vogt says that this appearance is characteristic of herpes, and it is obvious that in this case the slit-lamp is of immense value in diagnosis. No. 10 shows the slit-lamp view of the surface of the cornea in a very severe example of corneal herpes which has ended with calcification of the cornea.

It is in inflammatory states of the eye that the slit-lamp is of special value. Slight irritation or rise of intra-ocular tension causes a bedewing of the corneal surface, either the epithelial, the endothelial, or both. Under the high magnification employed the appearance suggests that of a mirror in a steaming bathroom. Vogt calls the condition "*betauung.*" The appearance is normal at the corneal periphery, but in abnormal circumstances it may cover the whole cornea. It is practically always found when the anterior chamber contains absorbing lens cortex.

Deposits on the endothelial surface, the so-called "K.P.," can be accurately localized and detected when the particles are too small to be seen with the simple lens (loup), but when they have been seen under the slit-lamp they can often be detected with the loup. These fine deposits can be seen both by reflected and incident light, and can be investigated by an alternation of both methods. This fine K.P. can often be found after operations on the globe which show no signs of inflammation when examined by the ordinary methods. The black variety is merely iris pigment and has no significance. Often (after a cataract extraction) there is a deposit which has the appearance of the dangerous "mutton-fat" K.P., but the eye microscope shows that

it merely consists of flakes of absorbing lens cortex, and this again is harmless. Koeppe, working with a magnification of 60 and over, professes to be able to classify the varieties of keratitic deposits, and from his examination to determine the nature of the inflammation.

In most deep corneal inflammations Descemet's membrane is thrown into folds, and occasionally Bowman's membrane is folded. No. 11 (Plate V) shows folds in Descemet's membrane which were noted after a normal preliminary iridectomy. They had entirely disappeared in two days. Such folds are almost constant after any operation upon the cornea, but exactly similar ones are seen in keratitis. A central keratitis may leave permanent radial folds unaccompanied by any marked deterioration of visual acuity; an example is shown in No. 12. In No. 13 a central keratitis, probably tuberculous in nature, has left folds of both Descemet's and Bowman's membranes. The fine star is due to the folds in Bowman's membrane. In this case the slit-lamp cleared up a very doubtful diagnosis.

A case of interstitial keratitis cannot be completely interpreted without the corneal microscope and slit-lamp. The extent and position of the vascularization can be mapped out, and by examining them by retro-illumination we can at once decide whether the vessels are still functioning or not. Many a case appears to be cured, the vessels are regarded as absorbing and functionless, but the slit-lamp shows that they still carry a rapid blood stream. Folds of Descemet's membrane are frequent and varied in character.

Anterior Chamber. Observation of the aqueous is difficult and calls for complete dark adaptation. It is best carried out by allowing the beam to pass through a pin-hole. We now obtain not a ribbon but a pencil of light. This pencil illuminates the cornea and the lens, but should be invisible in the anterior chamber. If, however, the aqueous contains albumin or is turbid the pencil of light is visible. If bright particles flash across

the beam then the aqueous contains discrete particles, cellular or otherwise. The movement of the particles is due to the heat eddy in the aqueous. The difference in temperature between the cornea and the iris causes a constant stream of aqueous in the anterior chamber, rising in front of the iris and falling behind the cornea. The heat of the slit-lamp beam induces vortex currents, and these cause the particles to move across the beam of light and become visible. The presence of cells in the anterior chamber is often the first sign of a sympathizing ophthalmitis. If in a case in which we have reason to anticipate sympathetic ophthalmitis we detect cells in the aqueous, we have a timely warning and can act accordingly.

Iris. The microscopy of the living iris is straightforward and is in the main merely an enlargement of what we see with the simple lens. We have, however, the great advantage that we can examine the iris in lens-light, by retro-illumination, and detect atrophy and ruptures of the pigment layer of the iris.

Lens. The slit-lamp is of most value in the examination of the lens, and it is in this region that it has won its greatest triumphs. The optical section made by the narrow ribbon enables us to see the lens in profile exactly as though the section had been made with a knife. It is at once obvious, even to the naked eye, that it is not homogeneous, but shows what Vogt calls dissociation areas: it can be separated into definite lamellae. Starting from before backwards, we can recognize the following regions: the capsule shining as a thin bright band; behind it, separated by a dark area, is another line very similar to the capsule, except that it has a stronger curvature and is more opaque and generally slightly yellow in tinge: this we can call the reduplication line. The next area is the cortex, followed by the well marked surface of the adult nucleus, which again has a shorter radius of curvature than that of the reduplication line. The next layer is called by Vogt the outer

embryonic nucleus; this again has a greater curvature than the adult nucleus. In the translation of Vogt's *Atlas* the word "*alterskern*" has been rendered as *senile* nucleus. This gives an entirely wrong impression, for this nucleus appears at about ten years of age, and is in no sense senile. *Adult* nucleus is better. The center of the lens is occupied by two plano-convex bodies always separated by a sharply defined, broad, dark line. This is the fetal or embryonic nucleus. The flat sides of this internal lens system face each other. On the anterior convex surface we find the anterior upright "Y," the primary fetal suture of the lens, and on the posterior surface there is an inverted "Y". In 25 per cent. of all cases there is a small opacity on the flat surface of the anterior body. This can easily be mistaken for a cataract.

Not only are these nuclei sharply differentiated in optical section, but when focused under the illumination of the broad ribbon they give mirror effects, and show up the characteristic figures of the sutures, and often it is possible to see the actual lens fibers. Lamellar differentiation becomes more obvious in the old lens, and especially when there is sclerosis of the adult nucleus.

It is obvious that the power to separate the lens into definite anatomical regions greatly enhances our powers of diagnosis and prognosis, and has an influence upon treatment. Baraequer makes a careful slit-lamp examination of the lens before he uses his suction apparatus, and by so doing he is able to form an opinion as to the conditions he will meet, and to decide whether the case is suitable for the suction operation.

No. 14 shows the normal lens in optical section. The drawing represents the lens unduly flat, but in other respects it shows a common type. Nos. 15 and 16 portray the extraordinary appearance that is sometimes seen on the surface of the adult nucleus. The patient had fair visual acuity, and to ordinary examination was an example of subcortical cataract. The slit-lamp

showed that the surface of the nucleus was studded with elevations like a hobnail boot. In section it is seen that they stand out into the cortex, and that each throws a dense shadow back into the lens. The surface of the nucleus is strongly condensed, giving the appearance of an internal capsule. The cortex shows lacunae and opacities which are typical of subcapsular cataract. It will also be noted that the nucleus has a stronger curvature than the capsule, and being sclerosed it caused a lental myopia; it was yellow in color. The myopia in this case was 5 dioptres.

Lamellar cataract forms an interesting study and takes many forms. No. 17 shows a fairly typical example. It will be noted that there is a condensation within the adult nucleus, and that the infantile nucleus is of different texture from the rest of the lens. It shows a scintillating mass of dots and in some lights has a stony appearance. It is here that the chief opacity to light is found. Instead of passing on, light is reflected from the sparkling particles. It is obvious that in this case there have been two periods of modified nutrition of the lens—one at birth and the second during the first ten years of life. These changes are comparable to ridges on the nails and teeth after illness. In this drawing the central plano-convex embryonic nuclei are very evident. At the back of the lens it is sometimes possible to see a ring or concentric rings—the "*bogenlinie*" of Vogt. To this is attached the remnant of the hyaloid artery, which the slit-lamp shows to be present in about 25 per cent. of all cases. The arc-line is probably the spot to which Cloquet's canal was attached. These structures are never found exactly at the posterior pole, where they would form an impediment to accurate vision, but on the nasal side. An example is shown in No. 18; this was seen in a child of ten and was symmetrical in each eye. The posterior inverted "Y" is seen, and radiating from it the lens fibrils. Just at the bifurcation of the nasal branch the arc-line is seen, and

above it a second curved line. From the circle depends the corkscrew-like remnant of the hyaloid artery. Behind the lens capsule we see the normal vitreous fibrils.

Vitreous. A complete examination of this structure calls for special apparatus. It is best to use an arc lamp instead of the nitra-lamp, and Koeppe's silver mirror; but much may be seen with the ordinary apparatus if the axis of the lamp is brought as close as possible to that of the microscope. The correct interpretation of what one sees in the vitreous calls for much experience. In some cases the vitreous seems to be almost optically homogeneous, in others it is full of floating fibrillae, of membranes, and particles, and yet is perfectly transparent.

Retina. The retina can be examined with the slit-lamp, but it is necessary to place a contact-glass upon the cornea to abolish its curvature, and to use the micro-arc lamp. Such investigations have great value from the standpoint of research, but they hardly come within the scope of ordinary clinical work. In cases of obscure tumors deep in the eye this technic may render valuable aid in diagnosis, but it is exceedingly difficult and also unpleasant to the patient.

It is self-evident that the slit-lamp and corneal microscope have greatly enlarged our powers of diagnosis and research. The anatomy of the lens has been elaborated to such an extent that even the most modern text-books are obsolete in this connection. Our knowledge of the vitreous has greatly advanced; in fact, before the advent of the slit-lamp its minute structure was unknown.

The great drawback to the use of the slit-lamp is that it definitely increases the time taken by an examination. It is time well spent, for the investigation adds enormously to the interest and value of our work.

Ophthalmoscopy in Medicine and Surgery. Ophthalmoscopy should be a most interesting subject for

general medical men and surgeons, if mastering the ophthalmoscope were not wrongly considered as next to impossible. The ophthalmoscope is a simple, inexpensive and useful instrument which can be mastered in a very short time if its study is approached in a proper manner. As pointed out by W. A. Fisher,[5] ophthalmoscopy is not taught in a practical manner in medical schools, and post-graduate teachers rarely find a student who can make a diagnosis with the ophthalmoscope unless he has learned its use outside of his regular medical course. General medical men, as a rule, cannot examine the interior of an eye, even with a dilated pupil. The ophthalmoscope is such a useful instrument that it should be taught to medical students as a laboratory course, with models, in the beginning of their studies.

Instructors of ophthalmology have their special system of teaching.

Eye Models. With an eye-model, the normal eye can be mastered first, then the diseases can be studied. The model has a pupil that can be made large or small, as desired, beginning with a large pupil, and as proficiency is attained it can be reduced. When the model is mastered, the study of the human eye is simplified.

It is not necessary to practice upon patients; in fact, a model is far better and pictures of almost all diseases of the eye can be found in it.

Fitting of Glasses. Patients often consult the family physician regarding headaches and poor vision. Many of them would be promptly relieved if proper glasses were prescribed instead of drugs. After long waiting and much treatment, glasses are given with success in many cases.

Practitioners should understand ophthalmoscopy in order to give their patients intelligent advice regarding many diseases positively diagnosed with the aid of the ophthalmoscope, such as hemorrhages of the retina,

(5) Ill. Med. Jour., November, 1924.

Bright's disease, albuminuric, diabetic, syphilitic and leukemic retinitis, choroiditis, sarcoma of the choroid, optic neuritis, optic atrophy and glaucoma. Many diseases easily recognized with the ophthalmoscope can be successfully treated, thereby relieving suffering, preventing blindness and even death. Some of the ablest general practitioners, surgeons and neurologists use the ophthalmoscope and make diagnoses of the interior of the eye, and it is surprising that this subject is not more generally understood, especially when it is within the grasp of all.

If medical schools would teach ophthalmoscopy and fitting of glasses to their students, their graduates would find the diagnosis of many diseases in their practice which would otherwise be overlooked, made easy and the treatment simplified.

Many diseases of the interior of the eye that the practitioner could see and diagnose with the ophthalmoscope could be treated with satisfaction to himself and patient.

Pathological lesions of the fundus are not difficult to diagnose if they can be seen, and if so, ophthalmic text-books are interesting and of great value. If the ophthalmoscope cannot be used, text-books on ophthalmology are practically useless.

Choked Disc. Blindness is common on account of undiagnosed swollen optic nerves. If a swollen nerve head (choked disc), usually caused by syphilis, is diagnosed and treatment instituted early, recovery is usually complete.

Optic Atrophy. This disease, usually following choked disc, is quite a common condition for an oculist to find, but would be very rare if the diagnosis (choked disc) were made early and proper treatment instituted by the family physician, who is often consulted first on account of headaches or blurred vision. Choked disc readily yields to treatment, but optic atrophy terminates in blindness. If the above is correct, as it

is, then it should be imperative that practitioners familiarize themselves with ophthalmoscopy.

Obstetrics. If physicians are to have the lives of parturient women entrusted to their care, they should have the benefit of this little inexpensive instrument.

Symptomatology

The Significance of Ocular Symptoms. Whatever line of practice the physician may be engaged in, his object is to relieve the patient's ailment. The first step is to find out what the patient is complaining of; in other words, to listen to his symptoms. Percy Fleming[6] has outlined in a general way the various ocular symptoms most frequently encountered, suggesting the significance that should be attached to them.

Pain. Naturally the first symptom to deal with is pain. It is, of course, impossible to measure its severity; as good a guide as any is whether it keeps the patient awake at night or not. Pain in connection with the eye of sufficient severity to prevent sleep, and at the same time associated with redness of the eye, suggests iritis, glaucoma, a foreign body, or abrasion of the cornea. The pain of iritis and glaucoma may be much the same—severe and deep-seated, round the eye, extending into the jaws, and occasionally producing vomiting. In the slighter cases of glaucoma it may be not severe enough to prevent sleep altogether and in such circumstances it usually disappears as a result of the sleep. So much importance is attached, and rightly so, to the fact that the pain of glaucoma usually prevents sleep, that the significance of a pretty severe eye pain which is relieved by sleep may be misunderstood. The condition of the pupil enables a diagnosis to be made between iritis and glaucoma—small in iritis, dilated in glaucoma. It is in such cases as these that a

(6) Lancet, May 23, 1925.

second opinion may be asked for, and the difficulty of diagnosis is much increased if the state of the pupil at the time of the onset of the pain is not known. Pain due to a foreign body or abrasion is intense but spasmodic, coming on with the movement of the eyelids, and therefore not uncommonly occurring at the moment of waking; a drop of fluorescin followed by cocain is a most useful method of revealing the presence of an abrasion or foreign body.

If the eyeball is quite normal in appearance and yet is said to be the seat of severe pain, it is possible that the pain may be exaggerated; but it is worth while keeping in mind the possibility of the pain being a prodromal symptom of ophthalmic shingles. A few days will suffice to clear up the diagnosis.

Discomfort about the eye with a feeling of gravel or grit in it, sometimes described as a burning sensation, getting worse in artificial light, indicates conjunctivitis, usually of a mild type. One of the commonest errors is the failure to recognize the condition known as spasmodic entropion. This occurs in elderly patients; the lashes of the lower lids roll in -do not grow in—and keep up a constant irritation of the lower part of the conjunctiva of the globe. The resultant conjunctivitis may be recognized and treated, but the cause is often overlooked.

Pain referred to the back of the eyes coming on *at once* when any close work such as reading or sewing is attempted may be a very troublesome symptom. It naturally suggests an error of refraction, or some want of muscle balance. Frequently in these patients the eyes are normal in all respects, and even if there be a little hypermetropia this would not account for the pain coming on at once and being referred to the back of the eyes. Life is spoiled by the inability to use the eyes—all kinds of glasses are tried without avail—one person is consulted after the other. What, then, does this symptom indicate? The condition is one of local

neurasthenia, an example of anxiety neurosis, and cannot be cured by any deliberate action of the will. The pain and disability persist until the attention becomes focused elsewhere; all the symptoms may vanish if a simple appendix operation be performed or the tonsils be enucleated.

Headache. Pain naturally leads to the consideration of headache. It is very easy to jump to the conclusion that a headache is due to an error of refraction and to neglect to search for some other possible cause. Before accepting the diagnosis of the ocular origin for a headache two conditions should be fulfilled. In the first place, it is not every error of refraction that is likely to cause headache; simple myopia, for example, may cause aching eyes, but not a headache. Hypermetropia and astigmatism, especially of *low* degree, are the particular errors most prone to cause headache.

Secondly, headaches of ocular origin should have the following characteristics:

1. *Age.* Ocular headaches are common in school life and up to middle age, but it is usually a mistake to attribute headache in a patient over 50 to eye-strain.

2. *Site: Usually Frontal or Supra-Orbital.* Many patients quite definitely put their thumb and index finger on the mid-orbital points to indicate the seat of pain. Another common situation is at the back of the neck where it joins the head. On the other hand, headache referred to the vertex probably should not be attributed to an error of refraction.

3. *Periodicity.* It frequently occurs on waking—gets better or even disappears after breakfast, returns as the day draws to a close, especially if the eyes are used for close work, but does not interfere with sleep.

It is perhaps worth while to explain the morning headache of eye-strain, as the fact of waking with a headache after a night's rest is often thought to exclude the eyes as the cause of the headache. Ocular headache is due to excessive accommodation necessitated by the

hypermetropic refraction. The accommodation is, of course, relaxed during sleep, but the actual act of waking necessitates an effort of accommodation on some very near object—the bed, the room—and later for shaving or doing the hair; and it is this sudden effort of accommodation that starts the headache. It follows from this that people who suffer in this way should get relief by putting on their glasses the moment they awake, and this is usually found to be the case.

Migraine. True migraine is preceded by subjective visual sensations, sudden attacks of half-vision—fortification spectra, zig-zags, and so on—which the patient naturally enough attributes to the eyes. Children may be shy of telling their experiences. In some cases the aura is the sole phenomenon, no headache following. The significance of migraine is that although the symptoms are strikingly ocular in character, it is the central nervous system which is at fault. It is maintained by some authorities that migraine can be cured by correcting the error of refraction. This is not the usual experience. Such errors should be corrected, but the treatment should not end there.

Certain subjective sensations are common and often give rise to much worry:

Floating Specks. In the vast majority of cases these muscæ volitantes do not indicate any organic disease, the important point is to find out if the specks seen by the patient stand still or move when steadfastly looked at. The average patient is, of course, not a good observer. He probably replies: "Oh, they move with my eye." Get him to try to look at them. Muscæ always move—will not, as it were, stand being looked at. If there is the slightest doubt as to whether they move or not, a thorough ophthalmoscopic examination with the pupil dilated is necessary to clear up the diagnosis. Some people, usually those who are not very busy, are much worried by these muscæ, simply live round them, draw them at different times of the day,

and are extraordinarily difficult to help. The first step is to make a thorough ophthalmoscopic examination and if the media are clear to assure them that the symptom is not a serious one, and try to persuade them to give up looking for the specks.

Seeing colored rings around light—the light, for example, resulting from a struck match is often the occasion of the observation. This may be a trivial symptom or one of grave significance. It may merely indicate a watery eye, or simple conjunctivitis, or be a symptom of glaucoma. The production of the rainbow colors as in the former case due to a drop of water sticking on the cornea, in the latter to fluid imprisoned in the cornea, the result of the increase of tension. Careful examination should make it easy to differentiate between the two conditions. If there be no conjunctival discharge, no watery eye, colored rings indicate glaucoma. Further examination will reveal increase of tension, haziness of cornea, and so forth.

Flashes of light—specially obvious in the dark—is not an uncommon symptom and may be due to several causes. In investigating it, first make sure that the patient is not describing the aura of migraine. The cause of the flash is some mechanical stimulation of the retina, so the symptom is always serious. If it occurs in a short-sighted individual, the chances are that a detachment of the retina is imminent, or is actually taking place, and a timely rest may prevent the occurrence of the detachment, and similarly the persistence of recurring flashes of light after a knock on the eyeball, as from a tennis ball, or the like, calls for careful examination, and the need for physical rest. Apart from their occurrence in short-sighted eyes, flashes of light may be due to that very insidious disease, cyclitis —the inflammation in the ciliary body causing a minute pull on the front part of the retina. Therefore, the significance of flashes of light associated with misty vision is that the eye is probably the seat of cyclitis.

Clearly the patient who experiences these flashes requires a very thorough examination of the eye; it is not a symptom to be regarded as trivial.

Dislike to light is more frequent than the preceding. This has a very varying significance. All are familiar with the intense photophobia and secondary spasm in the orbicularis that result from a corneal ulcer in a child, the spasm being more marked the more superficial the ulcer. It is always worth while in these cases to give a general anesthetic, otherwise the force required to separate the lids to examine the cornea may do considerable harm. This may seem a too drastic procedure. But it is the only way to examine the eye thoroughly, and the anesthesia is also useful for purposes of treatment. Short of this severe type, quite a number of people complain of inability to stand strong sunlight. Some of these will be found to have a fair complexion, fair hair, and more or less deficiency in the choroidal pigment, as seen by the ophthalmoscope. Frequently, too, they will be found to have a northern ancestry. It is this defect in the choroidal pigment that causes the dislike to light. It is important in considering this class of case to remember that the fair hair may become darker with advancing age, the pigmentation of the choroid, however, remaining deficient.

It is not always easy, but is sometimes very important, to distinguish this group from another group in which the symptoms are similar but are an expression of a neurasthenic condition — that is to say, people with a normally pigmented choroid and normal eyes may complain that they cannot stand bright sunlight or artificial light. It is very tempting to give these people tinted glasses. This really is the worst course to adopt, as they invariably require them darker and darker. They should be warned about this, and advised only to wear the tinted glasses on a very bright day.

Night blindness usually indicates impaired nutrition or actual destruction of the retinal elements. It is

a symptom of retintitis pigmentosa; it occurs also in syphilitic retinitis. In another group it is due to some general nutritional disorder, absence of fresh vegetables or vitamins, and these cases may be associated with a peculiar dry condition of the bulbar conjunctivæ. It is a well-marked symptom of scurvy, and was a familiar symptom when that disease was common. The symptom also occurs without any obvious retinal lesion as a congenital or familial disease. In this group the symptoms persist throughout life, but vision is not impaired. In the retinitis pigmentosa cases, vision slowly deteriorates and blindness ultimately results. In the war night blindness was frequently complained of without any physical cause being discovered—a form of anxiety neurosis—the cause of which it is quite easy to understand. A form of night blindness is experienced by very long-sighted people who wear strong convex glasses in the daytime with comfort, but find they cannot see with them out of doors after dark. They should be advised to dispense with the glasses when out at night.

[A word of warning should be given to the student, not to confuse the meaning intended by the author in the use of the words hemeralopia and nyctalopia. From the derivation of the words, hemeralopia means day vision and nyctalopia night vision. A number of authors use these words with this interpretation, but most American authors give the opposite meaning, that is, by hemeralopia they mean day-blindness, and nyctalopia, night-blindness.—Ed.]

Seeing worse in a bright light is rather a striking and unexpected symptom, as it sounds odd to see better when the light is dull. It occurs usually after 45, and suggests tobacco neuritis or early optic atrophy, the strong light quickly fatigues the already exhausted nerve. In another and, perhaps, more common group, at any rate in private practice, the symptom is due to a small, well-defined opacity in the lens, in the line of vision, usually at the posterior pole. Under the action

of strong light the pupil contracts and the opacity then practically fills the pupillary area. The patient with such cataract will say he cannot see anything on entering a room when he has to face the light, and his vision in the dark may suddenly turn to temporary blindness when he faces the headlights of a motor.

Color blindness is usually a congenital symptom. Acquired color blindness is a symptom of importance. It may be the earliest symptom of optic atrophy, possibly indicating tabes or tobacco neuritis. Obviously an individual's habits or occupation will largely be responsible for the early recognition of this symptom. Artists, who are often great smokers, will notice it early, as will also gardeners or anyone who has to match colors.

[Color-blind applicants for positions requiring normal color vision are occasionally quite skilful in knowing how to deceive the examiner. In such cases the examiner must make use of one of the well known efficient tests, and even then exercise keen oversight to avoid being deceived.—Ed.]

Red vision occurs in two quite different conditions —in young school children, and adults after a cataract has been extracted and cataract glasses have been worn. The child says the printed page suddenly looks red—the cataract patient finds the road, or sky, or trees looking red. Probably the explanation of the symptom is the same in both cases, the retinal vessels being situated in the anterior layers of the retina are traversed by the light on its way to the rods and cones. The eye is normally adapted for this red tinge, but if the vessels are congested, as they may be, from hypermetropia, or from too much light getting in the eye, in the absence of the lens the adaptation fails. The symptom is not serious and the treatment obvious. The cataract patient should avoid strong glare and use tinted glasses—the child should have the error of refraction corrected.

Symptoms Due to Refractive Errors and Defects of Accommodation. The significance of the usual symptoms due to an error of refraction or defect in accommodation are sufficiently obvious, but there are some that are worth mentioning. Uncorrected long sight, in addition to producing the characteristic headache already referred to, is a common cause of head-tiredness and general fatigue, and may be a factor in causing irritability of temper. The point to remember is that these persons do not complain of their sight, they see perfectly well, but examination shows their good vision is purchased by an abnormal effort of accommodation, and so it comes about that any depression of general health—for example, after influenza, or childbirth—brings these symptoms out and the temporary use of glasses may save much discomfort. The oculist is often told that the patient has been advised to postpone having his eyes seen to until he is stronger. This is a fallacy. Glasses, by obviating the need for the constant effort of accommodation, help these debilitated people to recover more quickly. Similarly, children at the end of term complain in this way and are all right in the holidays.

The other point worth noting is that the defect of accommodation due to age (presbyopia) under average conditions begins at 45, and by 60 all accommodative power is lost. This means that reading glasses suitable for 60 should be suitable for the rest of life. Hence, when people over 60 begin to grumble at their glasses and demand stronger ones, the complaint is significant of some organic change in the eye, most likely early cataract, possibly senile choroiditis. The enterprising optician will supply the stronger glasses, and they may be of temporary benefit, but this course is not advisable until the fundus has been examined.

People about the age of 45 to 50 sometimes complain of an inability or difficulty in opening the eyes in the morning, not due to the lids being stuck together by

discharge, they generally add that they have to lift the lids up with the fingers. This symptom, which may be called "*morning ptosis*," though sometimes due to ill health, is frequently associated with uncorrected or insufficiently corrected presbyopia, and will disappear when proper glasses for close work are worn.

Double vision should always be regarded as serious unless it be confined to one eye, a fact which should always be ascertained. It means something wrong with one or more of the muscles governing the eye movements and may indicate the beginning of serious disease of the central nervous system. A temporary form of double vision occurs sometimes after the eyes have been used for close work. It is not serious; indicates either the need for glasses or fresh glasses, and probably that the individual has been looking too close at the book or work, thereby producing over-convergence.

Multiple vision—for example, seeing three or more edges to the crescent moon or multiple lights when a single one is looked at—always signifies some early change in the lens. In this connection there should be noted another symptom sometimes called "second sight." A person over 50 discovers that whereas he has hitherto had to use glasses for reading, he can now do without them. This symptom is not so satisfactory as it seems. It means that some organic change is taking place in the lens, altering its refractive index. This change may or may not be visible with the ophthalmoscope. It may be due to glycosuria, and in any case of this kind the urine should be examined for sugar. If sugar be present, the so-called second sight will be found to vary with the amount of sugar present at any particular time—that is to say, the ability to read without glasses will depend on the amount of sugar present. When sugar-free the patient needs his old glasses for near work. If he becomes careless about his diet, the blood-sugar increases, the refractive index of the lens changes, and he can now read without

glasses. Therefore, if an elderly patient complains that some days he is short-sighted and on other days he can see quite well at a distance, he is almost certainly the subject of glycosuria.

Closing one eye to read may indicate disease of that eye, but quite frequently is due to weakness of the power of convergence, a common condition in elderly people. The patient, knowing nothing of the real reason for his closing one eye, naturally concludes that that eye is the bad one and complains that he cannot see with it. As a matter of fact he can see quite well with either eye separately, but not with the two together.

Nystagmus. A rare symptom to be mentioned spontaneously by the patient is that fixed objects, when looked at, appear to move or to be unsteady. This is due to nystagmus; indicates that it is of recent origin. Congenital nystagmus never produces this effect.

Vertigo may be, but only rarely is, due to defect in muscle balance, either a definite squint of recent paralytic origin, or one which, *up to the present,* has been rendered latent by an unconscious effort of compensation, but which now has become obvious owing to some weakness or debility making such compensation impossible. A vertical deviation is more prone to produce giddiness than is a lateral one. A simple test for ocular vertigo is to note if the giddiness disappears when one eye is shut. If it does, it clearly is due to some defect in binocular vision. Much can be done in some cases of ocular vertigo by the use of prismatic glasses.

We often hear a patient complain of *his eye being weak.* The use of this term generally indicates an absence of clear thinking or accurate observation and an attempt should be made to ascertain what the patient really means. One will mean a watery eye; another that he cannot see small print; yet another that he cannot stand strong light.

Vomiting should be included as an ocular symptom.

More than one case of glaucoma has been met with in which vomiting, not failure of sight, was the symptom which made the patient seek advice. Vomiting may be due also to the use of too strong eserin drops, and may accompany, or perhaps mask, some injury to the eye. Although strictly speaking not an ocular symptom, it is worth noting that the use of atropin or hyoscin drops may in susceptible subjects produce the symptoms of general poisoning, giddiness, restlessness, and even delirium. To prevent or diminish the risk of such occurrence, drops should be instilled at the outer canthus and not over the lacrymal punctum.

Papillitis. Papillitis due, for example, to a tumor of the brain or to some toxemic condition—renal disease or pregnancy—may exist for a considerable time without producing any effect on vision. Occasionally it may give rise to a *temporary* loss of vision, noticed, perhaps, on waking or on going from a well-lighted room to a darker one. The loss of vision may be so slight and temporary as not to call for much notice. The significance of these facts is obvious. The fundus should be examined in all cases of persistent headache, especially if it be of a severe character, even though there be no complaint of loss of vision. And similarly, if this apparently trivial symptom—temporary obscuration of vision—occur in the course of pregnancy associated with albuminuria, an examination of the fundus should be made at once. A timely termination of the pregnancy may prevent permanent loss of sight.

Refraction

Refraction Work in General Practice. Refraction work in general practice is, or ought to be, just the same as refraction work in specialist practice—the same principles are involved and the work should be done in the same way. Alexander MacRae[7] gives some hints on

(7) Brit. Med. Jour., December 6, 1924.

equipment and procedure which may be of some use to those who are interested in the subject and have to do their refraction work in the time they can spare from the work of a general practitioner.

The first step, if the patient has worn glasses, is to examine them and note what they are, and also who prescribed them.

Before returning the glasses to the patient you should see whether the optical and geometrical centers coincide—again by the use of the window frame, or any convenient horizontal and vertical lines—and in any case should measure and note the distance between the optical centers. A straight steel millimetre rule is convenient for this purpose.

The next thing to note is any abnormality in the general appearance of the patient's eyes—epiphora, conjunctivitis, slight reddening of the corneo-scleral margin, and the like; and also whether there is any nystagmus or obvious squint. The room is then darkened and the eyes examined by focal illumination.

Focal illumination will show, among other things, corneal opacities, abnormalities of the pupil such as the Argyll-Robertson pupil of tabes, or general paralysis of the insane; the tremulous iris that indicates a dislocated or extracted lens; the dilated and feebly reacting or immobile pupil of glaucoma; the contracted pupil of iritis; irregularities in the shape and size of the pupils, and so on. The size of the cornea and the depth of the anterior chamber are also worth noting. We are apt to imagine that the size of the cornea is much the same in all eyes, but anyone who has done a few cataract extractions or has made any use of Schiotz's tonometer knows that there is considerable variation in the corneal diameter. The foot-piece of the Schiotz tonometer, which is placed on the anesthetized cornea, measures 10½ mm. across. In some eyes there is very little corneal margin to be seen when the instrument is in position, while in

others quite a wide band remains uncovered. The importance of this point in refraction work is that an eye with a small cornea has presumably less adequate provision for the escape of aqueous into Schlemm's canal than the eye with a large cornea; and when we are examining such an eye and note that the anterior chamber is also shallow we should resist all temptation to dilate the pupil. Even a mild mydriatic like cocain might be sufficient to produce an attack of acute glaucoma in such an eye.

The final point to notice in this part of the examination is the condition of the lens, and here a word of warning may not be out of place. The concentration of light on the eye in focal illumination is apt to produce a white appearance in the depth of the lens, and the inexperienced observer may mistake this for an opacity.

The next step in the dark-room examination is the inspection of the eye with the plane mirror of the opthalmoscope. In this way faint corneal nebulae that have escaped notice in the previous examination are easily detected. They are important to note, for their presence if central will make a great difference in the patient's visual acuity and will readily explain his failure to read 6/6 when he comes to the subjective tests. Cataract, if present and central, is at once detected; while the failure of the red reaction in one position of the eye would lead one to suspect a detached retina, a dislocated lens, or an intra-ocular tumor.

Then comes the examination of the fundus of the eye with the concave mirror and the hand lens—the indirect method. The disc, periphery, and macula are examined rapidly in turn, the clearness or otherwise with which the fundus is seen giving one an idea of the condition of the vitreous. This finishes the preliminary examination. It takes a long time to describe, but in a normal eye takes only a couple of minutes or less to carry out. If any abnormality is detected it can be further investigated by the direct method. If none is seen it is at least

worth while knowing that the eye is apparently normal.

The next step, if one has an astigmometer, is to use that. It is undoubtedly most valuable, giving in one or two minutes information that may take ten or fifteen to acquire by retinoscopy—namely, (1) the amount of corneal astigmatism present, and (2) its axis. Retinoscopy is then proceeded with in the usual way, the patient being seated with his eyes as nearly as possible one meter distant from the ophthalmoscope. The light is adjusted to a position just behind the patient's head, either just above or close to one side; in either case it must be so obscured by his head that the light does not shine on the back of the lenses in the trial frames. The trial frame is then fitted and lenses inserted till the shadows are reversed. You can assure yourself that the correction is good by leaning slightly forward, and then somewhat back from your position of one meter distance, and noting how the shadows move in each position. If in one direction when leaning forward and the opposite when leaning back one may be satisfied that the lens is approximately correct.

One very important point is the direction in which the patient fixes his eyes. Theoretically he should look directly into the mirror, as it is the refraction in his visual axis that you want to find, and when his accommodation is paralyzed by a cycloplegic he should do so toward the end of your examination when you have found his approximate correction. If his accommodation is not paralyzed the pupil will contract too vigorously if he looks straight at the mirror for any satisfactory retinoscopy, but he should be told to look as close as possible to the top or side of your head. If you allow him to look a foot or two away you may get a beautifully illuminated pupil and much easier shadows to watch, but you may find when you come to the distance test that you are as much as two diopters out in your estimate.

The next step is to try the effect of the lenses you have

found with the Snellen's types at 6 meters distance. Besides the test types you should have on your consulting room wall some form of astigmatic fan and also Maddox's tangent scale.

The illumination of the test cards is an important point. The ideal thing is to use a dark room with a vertical series of lights, shaded from the patient, shining on the card in such a way that all the letters are equally illuminated. In any case it is advisable to use artificial light, as you can insure your tests being always done under the same conditions.

The patient is now seated at 6 meters distance from the Snellen's types with a blank disc in the trial frame opposite his better eye. You test the worst eye first to prevent the patient getting too familiar with the letters in the lower rows. Opposite this eye you then insert any cylinder you may have found necessary by the ophthalmometer or the shadow test, and a spherical lens in hypermetropia which you know to be too strong and in myopia one which is too weak. The patient then reads as far as he can. You then proceed to add *minus* spheres until you reach a point where a further sphere, though he may say he sees better with it, does not enable him to read any further. You then see if alteration in the angle of the cylinder improves his vision. If not, the next step is to use a crossed cylinder. You can do this by taking the 0.25 *plus* and *minus* cylinders from your trial case, holding them together with their axes at right angles to one another, and placing them in front of the patient's eye with one of the axes in the same plane as the axis of the cylinder he is wearing. If this is no improvement you try it the other way round. If he is wearing a *plus* cylinder and you find that when the axis of the *plus* cylinder in your combination is parallel to its axis he sees better, then his cylinder is probably too weak; if he sees better with the *minus* cylinder parallel to the axis of his cylinder, then his cylinder is too strong. You make the necessary alteration in the cylinder, test again with the

weak *plus* and *minus* spheres, and then again with the crossed cylinder, till you have found the combination that gives him the best vision.

The other eye is then similarly tested, and then the vision with both eyes wearing the correcting lenses is taken and you see whether the patient will accept any additional *plus* spheres when both eyes are open.

The next step is to test the patient's near point with each eye separately while wearing the correcting glasses. If you find the amplitude of accommodation markedly less than it should be at his age you may suspect a spasm of the ciliary muscle—not such a very uncommon condition, and one which it is important to diagnose and treat, as it is responsible for a good deal of suffering.

Having tested the patient's near point, it is advisable to put a Maddox rod in front of the correcting lenses in the right eye and test for any latent defect of muscular balance. Of these the most important is hyperphoria, the test of its presence being that when the rods are vertical the patient sees the red horizontal line either above or below the light in the center of the tangent scale. When this is found the prism necessary to correct it should be found and noted. The rods are then placed horizontally in the trial frame and the patient tested for esophoria and exophoria—the vertical red line in this case being either to the right or left of the center light. Practice varies as to whether these defects should be corrected or not. If a patient who has given his glasses a good trial—say six weeks or more—still complains of eye-strain, and especially if he is troubled with diplopia, then retest with the Maddox rods and consider the question of prescribing prisms.

If the patient is over 40 he should now be tested with the near types to see what addition, if any, is necessary for near work. It is very important to find out exactly at what distance the patient wants to see—a short man with short arms will probably hold his book about 10 inches from his eyes; patients of another build will

prefer it 13 inches away or even more: while a pianist requires vision at about 20 inches, and a laundress ironing at a table may want even more. The near vision addition would, of course, be different in each of these cases.

The chief mistake to avoid is giving the patient too strong an addition for close work. If you test the patient with a strong light behind him shining on the near types he is very likely to take a stronger lens than he requires, and he will probably complain when he comes to try the glasses afterward that he feels they are "tearing the eyes out of his head." As a rough working rule for the patient who reads at 13 inches, the usual distance, we add +0.5 at 45; +1.75 at 50; +2 at 55; and +2.25 at 60—he should never require any stronger addition than this to his distance glasses.

At the same time it should not be forgotten that a patient after 50 gradually develops an acquired hypermetropia, so that his distance glasses require gradual strengthening. A man who is emmetropic at 50 may require as much as +2.25 spheres for distance when he reaches the age of 80, and, of course, his near glasses will have to be correspondingly strengthened. The *addition* to his distance correction for reading at 13 inches should probably never be greater than 2.25 at any age, with the possible exception of myopic eyes, as in them the range of accommodation is usually defective.

The next step, and a very important one, is to measure the distance between the patient's eyes both for distance and for near vision. The patient should wear his correcting lenses during this test and should, of course, fix a distant object when he is wearing his distance glasses, and a near when he is wearing his near glasses.

The patient is now ready for his prescription. One of the snags in writing this is, that there is so much confusion in the way the angles of cylinders are marked. The standard method is to make the left side of each of the patient's eyes as you look at him zero, and measure

the degrees from that counter-clockwise. But you will find trial frames and prescription forms marked in all sorts of ways—zero sometimes at the temporal, sometimes at the nasal side of each eye; sometimes at the temporal side of one and the nasal of the other. If you have not a prescription form with a diagram on which you can mark the angle it is always advisable, after writing the strength of your cylinders and the degrees of the angle, to draw a horizontal line and then draw a line from one end of this to show roughly in what direction the angle is to be measured.

Before the patient goes you should give instructions as to whether the glasses are to be worn constantly or not; you should warn the patient (unless you have prescribed periscopic lenses) that he must learn to turn his head when he wants to see anything to the side, so that he always looks through the center of his glasses; hypermetropes and anisometropes should be warned that they may require some weeks of constant wear before the glasses become comfortable; patients who are given cylinders at an angle for the first time should be warned that at first they will be troubled by straight lines not in the direct line of vision appearing distorted; while all patients, but especially children, should be advised to take their spectacles to the optician from time to time to make sure that the frames have not got twisted.

The final point is to insist that the glasses should be sent to you to be checked before the patient wears them. The oculist finds a frame that fits nicely on the patient's nose and looks neat, and he will often fit lenses into this without any regard to the interpupillary distance. Glasses undoubtedly look neater when the lenses are not very wide apart, and there is no objection to the optician using such frames so long as he decenters the lenses outwards so that the distance between the optical centers is correct.

A mistake in the centering of the lenses is often an unsuspected cause of eye-strain. This is not to be won-

dered at when you remember that a spherical lens whose optical center is not opposite the center of the pupil has the action of a prism. An error of only 4 mm. (1/6 inch) in the distance between the optical centers of a pair of +5 spectacles will have the same effect as putting a No. 1 prism before each eye. When weak lenses are concerned the prismatic effect of wrong centering, if only a few millimeters out, does not matter much; but when you have to prescribe strong lenses in either hypermetropia or myopia it is very important to satisfy yourself that the optical centers are exactly the right distance apart.

[The Editor is in accord with the great majority of American ophthalmologists in believing that a correct estimation of refraction cannot be obtained without the use of a cycloplegic. Unless contraindicated, this is done in practically all cases up to 40 years of age.—Ed.]

The Eyelids

Congenital Coloboma of the Eyelid. Cases of congenital coloboma of the eyelid of slight degree, varying from a small notch to a V shaped defect in the lid, are rare. Cases with complete absence of a large portion of the lid are exceedingly rare.

Sanford R. Gifford[8] reports two such cases, and seeing a photograph of a third, within three months.

Case 1. A healthy boy, aged 8, showed no abnormalities of development except those to be described, which had been present since birth. Vision was: right eye, 20/30; left eye, 20/200. As shown in Plate VI, *A*, about half the left upper lid was entirely absent, there being no sign of a tarsal plate in the region, no cilia, nor signs of meibomian glands. On the lower, outer part of the cornea and sclera was a large, solid dermoid, which, when the eyes were closed, fitted into the gap in the

(8) Jour. Amer. Med. Ass'n., June 13, 1925.

PLATE VI.

A—(Case 1)—Condition before operation.
B—(Case 1)—Appearance five weeks after operation.
C—(Case 3)—Appearance of patient while asleep.
D—(Case 2)—Condition before operation.
E—(Case 2)—Appearance five months after operation.
—Gifford, page 66.

upper lid. A small, hard nodule was present just above the skin border of the defect. Two similar nodules were present near the left auricle, and the parents stated that a fairly large cyst had been removed from the left cheek. The right eye and eyelids were normal.

At operation, horizontal incisions were made from each side of the defect parallel with the lid border, freeing each fragment of the lid entirely down to the conjunctiva. The external incision was carried well out on the temple, and both angular ligaments were cut so that the fragments could be brought together easily. An incision was made around the defect, and skin and conjunctiva were separated. The conjunctival edges were united by three silk sutures; a mattress suture was placed, carefully apposing the two edges of the lid border, and tied over a gauze roll. The vertical skin defect was closed by mattress sutures, and the horizontal cuts by one continuous suture. Tension sutures were placed between the two fragments, relaxing all pull on the skin sutures, and tied over gauze. The stitches were touched with 2 per cent. silver nitrate every day, and at their removal in two weeks union was good. The shadow shown in Pl. VI, *B* is not a notch in the lid border, which appears very smooth, but a depression in the skin surface above the border. Though the levator was divided necessarily, the lid can now be raised fairly well. After two weeks the corneal growth was dissected off, enough epithelium being left to be easily pulled over the exposed sclera to the limbus. Fairly clear cornea was found beneath the growth. Sections of the tumor showed it to be a solid dermoid, containing hair follicles, muscle and fat. The cosmetic result is better than expected, though it could be improved by removal of the small nodule which marks the previous border of the defect.

Case 2. A girl, aged 19 months, was seen in the same month. The condition of the lid (*D*) was almost the same as in the first case. The whole inner half of the

right upper lid was absent, except a very thin inner fragment including the canaliculus. Fairly marked epicanthus was present, and both left canaliculi were absent. Down and out on the sclera in each eye, encroaching slightly on the cornea, were large, soft, fatty tumors, resembling the congenital lipomas usually seen on the sclera above the external rectus. On the tragus of both auricles were soft, pedunculated nodules the size of a pea. At the first operation an attempt was made to close the defect by carefully uniting the edges, using tension sutures, the lateral flaps being freed and the palpebral ligaments divided subconjunctivally. The upper part of the defect healed well and remained closed. In the lower part, however, the stitches did not hold. This part was later closed again, the edges being excised to present a larger raw surface, and healing this time was complete, and the cosmetic result good (*E*).

Case 3. Of the third patient, a baby, aged 11 months, only the photographs have as yet been seen. They show a coloboma of the upper lid (*C*) almost as large as that seen in the other two cases.

According to Parsons, the theory that best explains these defects, and their frequent association with other congenital anomalies, such as dermolipomas (27 out of 65 cases) is that they are due to amniotic bands. The upper lid is usually involved in its inner portion, as in our cases, but the defect is usually triangular and much smaller. Rare defects of the lower lid, with fissure of the zygoma and other bones of the face, are due to failure of the maxillary and frontal processes to unite.

In operating in these cases and the more frequent traumatic defects that resemble them, the complete freeing of both portions of the lid is the essential thing, and this is greatly facilitated by cutting the palpebral ligaments subconjunctivally, which allows a surprising amount of displacement without tension on the sutures. Another point is accurate coaptation of the palpebral borders by a mattress suture, tied over gauze or rubber,

so that it will not cut out. A third point is the use of tension sutures. Though skin grafting is naturally thought of, it must be remembered that both an outer and inner covering must be supplied, with some solid tissue between the two. The only satisfactory source of such materials is the auricle, but there is always the danger that this will slough, besides the inconvenience of a second far from trivial operation on the auricle, which may itself cause some deformity.

Simple Operation for Relief of Mild Types of Entropion and Ectropion of Lower Lid. Among the cases of functional and organic entropion and ectropion seen by the ophthalmic surgeon, there are quite a few of such a mild type that they do not seem to justify a radical operation. Notwithstanding the irritation and annoyance they cause, these patients are often allowed to drift along with negative rather than positive treatment. For example, there is the type of entropion frequently seen in elderly people with flabby lids who develop a spasmodic contraction of the lower lid after the eye has been bandaged for a few days. The treatment that naturally suggests itself to the surgeon is to draw out the lid and fix it in position by means of flexible collodion or a strip of adhesive plaster. When these methods fail to give permanent relief, as they often do, then there are a variety of more radical operations to choose from; among these are Snellen's sutures, the actual cautery puncture of Ziegler, a linear eschar near the margin of the lid by means of a stick of caustic potash, as suggested by Theobald, canthoplasty, and the removal of a longitudinal strip of skin from the lower lid.

Then there are numerous cases of a mild form of trachoma, which runs its course without much damage to the eye, save for a slight entropion of the lower lid with trichiasis. Perhaps there may be only a few eyelashes misdirected, but these are sufficient to cause constant irritation which may lead to ulceration of the

cornea. The majority of these patients provide themselves with cilium forceps, and from time to time have some member of the family remove the offending lashes.

There are also many cases of a mild type of ectropion due to chronic conjunctivitis, to loss of tone of the lid structures (senile ectropion) and to lacrimal disease. In obstruction of the lacrimal drainage system, it is quite common to find a partial ectropion at the inner canthus of the lower lid, with thickening of the conjunctiva, due to the constant use of the handkerchief to wipe away the tears. The usual treatment for slight degrees of ectropion is astringent washes, slitting the lower canaliculus, or wearing a compress bandage.

The operation here described by J. E. Jennings[9] is designed to relieve the types of entropion and ectropion mentioned above. The instruments required are a Beers knife, scissors, No. 1 catgut sutures and a needle holder. To avoid pain, a few drops of a 1 per cent. solution of procain is injected under the skin of the lid at the seat of operation. Procain acts slowly, so that to assure complete anesthesia the operation should not begin until fifteen or twenty minutes after the injection.

Operation for Entropion. One should first estimate how much the lid must be drawn to eliminate the entropion and make the length of the incision just twice that amount. If the lid turns in one-fourth inch, then the incision should be one-half inch long. The incision is a vertical one, commencing just below the lid margin and extending downward one-half inch, dividing skin and superficial fascia. Without undermining the skin, a vertical suture is introduced through the skin above the upper extremity of the incision, carried down along the bottom of the wound and coming out through the skin just below the lower extremity of the incision. When this suture is tied, the margin of the lid is drawn down, and what before was a vertical wound now becomes a horizontal one, which is closed by two more vertical

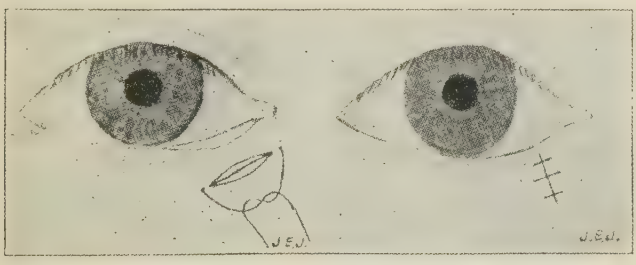
(9) Jour. Amer. Med. Ass'n., Oct. 25, 1924.

sutures, one placed on each side of the central one. If the length of the incision has been estimated correctly, the lid margin will have regained its normal position and perhaps show a trace of ectropion, which will disappear in a few days. (Fig. 7.)

A B

Fig. 7.—Entropion operation: *A*, incision and central suture; *B*, operation completed.

Operation for Ectropion. The operation for ectropion is similar to that for entropion, except that the incision is horizontal and should be made a little longer to get a decided amount of overcorrection. The horizontal incision should be placed near the lid margin under the



A B

Fig. 8.—Ectopion operation: *A*, incision and central suture; *B*, operation completed.

most pendent part of the lid. When the central suture is tied, the ends of the incision are drawn together, forcing up the margin of the lid and changing the horizontal wound into a vertical one, which is closed by

two more sutures, one placed on each side of the central one. As there may be considerable tension on the sutures which might cause them to tear out, they should be supported by strips of adhesive plaster until healing takes place. (Fig. 8.)

The advantages of this operation in the mild types mentioned are:

1. It is simple and easy of execution.
2. The skin of the lid is not sacrificed.
3. It is not dependent for success on the formation of scar tissue.
4. The wound is clean, and heals by first intention.

Trichiasis. A radical operation for trichiasis of the upper lid is devised by David,[1] which resembles Panas' operation, but the cutaneous surface of the lid is not touched and consequently there is no resulting visible scar. He makes an incision parallel with the lid margin

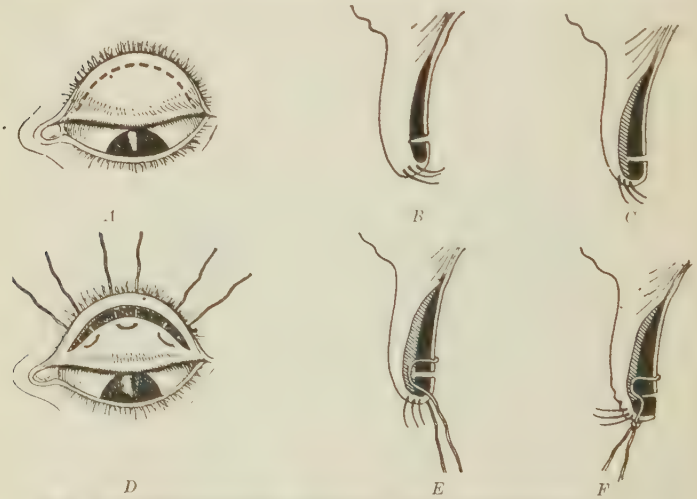


Fig. 9.—David's radical operation for trichiasis of the upper lid. *A*, Course of incision. *B*, Incision completely through tarsus. *C*, Dissection of two tarsal flaps. *D*, Insertion of sutures. *E*, Course of each end of suture. *F*, On tying the knots the lower tarsal flap is everted.

(1) Arch. d' Opht., v. 40, 1923.

through the conjunctiva and the whole thickness of the tarsus, dissects the two tarsal strips from the overlying muscle, and inserts sutures passing from the extreme edge. (Fig. 9.)

The Ocular Muscles

Congenital Defects. In an otherwise healthy subject Blatt[2] found complete absence of the left orbicularis, producing lagophthalmus and epiphora. On attempted closing of the eyes, Bell's phenomenon could be noted in the left eye, thus ruling out hysteria.

The Etiological Treatment of Strabismus. As stated by W. E. Boynton,[3] all cases of strabismus are organic in their ultimate etiology, whether they are refractive, neurotic or muscular in their proximal causation.

From the standpoint of *treatment*, however, they may be divided into two major groups: (1) the functional and (2) the organic.

The functional cases are those in which normal muscles act abnormally because of abnormal nerve impulse.

The organic cases are those due to an inequality in the relative length, strength or leverage of antagonistic pairs of muscles.

That there are many borderline cases is true, cases in which the muscular, accomodative and neurotic factors are intermingled in various — and at times varying quantities.

And further, all functional squints tend to become organic as time passes, through contraction of the one muscle and attenuation of its antagonist.

The first point in the treatment of strabismus, therefore, is an exact differential diagnosis in each and every case. A careful determining of the casual factors present, and the relative and absolute value of each.

(2) Klin. Monatsbl. f. Augensh,, v. 72, 1924.
(3) Ill. Med. Jour., December, 1924.

In many instances the untoward results that have occurred from operative treatment in the past have been due to the lack of such a differential diagnosis in the individual case.

With our present knowledge of the subject and the diagnostic means at hand, an exact differential diagnosis is possible in almost every case, and there is but a little excuse for empiricism in the surgical measures employed.

Differential diagnosis, here as elsewhere, is often a process of elimination. That some one casual factor may stand out prominently in a given case should be no excuse for overlooking or ignoring other possible factors, which may or may not be present. Correct findings demand a careful examination.

Then, too, the surgeon should have no time bogey. More than one sitting is usually required, for the most willing patient soon becomes fatigued under a long continued testing, and the most intelligent may give contradictory findings under the influence of fatigue, while the younger and less responsible soon cease to co-operate in the diagnostic efforts.

As the etiology of strabismus admits of two major divisions so there are two major means of differential diagnosis, (1) the cycloplegic and (2) the tropometer.

The cycloplegic gives definite information as to the presence and the importance of the accommodative factor. The tropometer measures the scope and smoothness of the action of each of the four recti muscles individually, and gives definite information as to the presence, character and amount of any defect in the action of each.

These data obtained, the accommodative and muscular factors known, there remains only the neurotic factor, regarding which there are several hypotheses but little definite information. We arrive at the neurotic factor, therefore, by an elimination of the two more tangible factors.

Under complete cycloplegia the value of the accom-

modative factor is determined with a reliable degree of accuracy. It is evident that this is especially true in the younger patients, where visual habits and secondary muscular changes have not had time to occur.

The changes occurring in the accommodative squint under cycloplegia show both the character and the importance of the accommodative factor, that due to accommodative excess becomes characteristically less pronounced and may disappear entirely; while that due to accommodative insufficiency is proportionately exaggerated. That this diagnostic phase is suggestive rather than conclusive is self-evident—the real estimation and elimination of the accommodative factor can be accomplished only by the use of correcting lenses supplemented if need be by a thorough trial of gymnastic measures over a specific period of time.

That the error of refraction bears a close relation to the degree of accommodative excess or deficiency is often true—that it bears no such relation whatever is not infrequently discovered. Just why this close association occurs in one case and is absent in another has not been fully explained. And for our present needs it is not imperative that it should be.

Given a case in which the accommodative factor is present or suspected—the primal indication for treatment is to take definite means to eliminate it. The continuous wearing of properly fitted lenses changed at intervals as needed, usually produces the result.

The diagnostic value of the tropometer in strabismus can scarcely be overestimated. A careful use of this instrument will furnish exact data as to the action of each individual rectus muscle. It gives the scope and steadiness of its action and the alacrity of its response.

If the action of a muscle is defective the tropometer determines the character of the defect and definitely measures its degree. These findings are absolute for the muscle under test and relative as regards its antagonist.

As emmetropia may be indicated by a visual acuity

of 20:20 without accommodative effect, so a normal muscle balance is indicated by the ratio of 50:50. Any deviation from this ratio of 50:50 is considered abnormal and the character and amount of the deviation are taken as indicating the character and amount of the correction required. For example: A ratio of 50:50 being normal, a ratio of 50:70 would show an excess of 20 points in one of the muscles; a ratio of 50:30 would show a corresponding deficiency in the muscle at fault, while a ratio of 70:30 would show an excess in one muscle and a deficiency in its antagonist.

That the numerical ratio of 50:50 is arbitrary is readily admitted—for not all patients possess an ocular motility of that range. A normal individual may show a range of 45:45, or 40:40, or even 60:60. The number of degrees of motion is inconsequential so long as the ratio of 50:50 is present and maintained.

Our diagnostic measures established and their findings noted the matter of treatment becomes relatively simple in theory and, allowing for idiosyncrasy in the occasional patient, treatment so based is successful to a very satisfactory degree.

This treatment will be as follows:

1. *The neurotic squints:*
   - (a) A commendable use of discretion.
   - (b) The correction of the error of refraction.
   - (c) General measures—preferably outlined and administered by the family physician.
   - (d) The use of the prisms or gymnastic exercises carefully selected and definitely supervised.
2. *The accommodative squints:*
   - (a) The continued use of correcting lenses.
   - (b) Frequent re-examination as the growth and development of the patient may suggest.
   - (c) Ocular hygiene.
3. *The muscular squints:*
   - (a) Careful correction of the refractive error to

be worn continuously, or at least until the *absence* of the accommodative factor is established.

(b) Careful estimation of the action of each horizontal rectus—repeated at different sittings until an average reading for each muscle is secured.

(c) Operative measures performed under general anæsthesia.

(d) Removal of the conjunctival sutures in one week and the muscle sutures in two weeks.

What of the operative measures:

(a) The lessening of the leverage of a muscle showing excess by a complete tentomy—the gap bridged by stay sutures.

(b) The shortening of a muscle showing efficiency by tucking the tendon of the muscle.

(c) The amount in each instance being 1.50 mm. for each 5° of defect up to 20° and 1 mm. for each subsequent 5°.

The assertion that all squints are due to an undeveloped fusion center is merely an hypothesis, not a demonstrable fact.

That a defective fusion center may have much to do with the neurotic cases, is probably true. That it has nothing whatever to do with the truly muscular cases is easily demonstrated by use of the tropometer.

The tropometer is a monocular test. There is nothing for the patient to look at and, therefore, there is no demand upon either the accommodation of the fusion impulse. The tropometer gives positive data as to the strength, alertness and endurance of the single rectus muscle under test. The observer can see the eye move and can study its motion, and there is nothing hypothetical about it.

The fact that squinters do not suffer from diplopia proves nothing, for the fusion impulse is facultative, as

most users of the microscope or opthalmoscope know.

That strabismus may be absent in high hyperopia shows that a disassociation of the co-ordination between accommodation and convergence may exist, perhaps due to some special control exerted by the fusion center. However, in these cases the tropometer always shows an equality in the strength, alertness and endurance between the opposing recti muscles.

On the other hand, a tangible muscle defect is always present in those cases of strabismus occurring with low degrees of refraction, and in all cases which do not disappear under correcting lenses. This defect is definitely shown by the tropometer before operation and is generally demonstrable at the operation as a relative or absolute inequality in the length, size or leverage between the opposing recti.

The muscular cause will not account for every case, but is present as a tangible and demonstrable factor in a large percentage of cases—to be seen and measured by all who will.

Alternating Squint. As one reviews the literature on strabismus, he is struck by the few references to alternating squint, and by the lack of definite information concerning its management. The text-books give practically no advice concerning treatment, the authors contenting themselves with the remark that these cases are less favorable for operation than monocular squint, or that permanent diplopia may follow operation.

Worth divides alternating squint into two classes: (1) accidental alternating squint, in which the refractive error is about equal in the two eyes, and which, if untreated, tends to become unilateral, and (2) essential alternating squint, in which there is usually little or no refractive error and the visual acuity in each eye is perfect. These two types comprise about 15 per cent. of the cases of squint. The squint may, of course, be convergent or divergent. Amblyopia exanopsia does not occur in these cases, and that is a strong argument in

favor of the theory that this condition is the result of non-functioning of the fovea, rather than that the squint is due to amblyopia of congenital origin.

The treatment consists in optical correction of any ametropia which may be present, followed in the majority of cases by operation. Fusion training is impossible, as there is a total congenital absence of the faculty of acquiring fusion. According to authorities, there is no hope of securing binocular single vision in alternating squint, and one might expect at best only a cosmetic result. These statements may be true to a great extent, and undoubtedly are in many cases.

E. L. Goar and W. Ralston[4] present two cases that they have followed closely, which prove that the above statement is not always true. That is, it is possible to obtain results from fusion training.

A New Operation for the Correction of Squint. Volumes have been written on squint, for which many operations have been performed with both their good and bad modifications.

A. Whitmire[5] presents an operation which he has modified from Reese's resection, adding a scleral suture for fixing the tenotomized end of the opposing rectus in a fashion enabling a suture to be placed at any accessible distance from the limbus—even directly over the "danger zone." Until recently, this technic would have been considered quite dangerous, in that the sclera, being of the thinness of paper, perfectly smooth and sometimes transparent to the extent that the choroidal pigment shows through. Here the greatest care is necessary in order that sufficient fibers are divided to hold a No. 3 silk thread, against the forward pressure of supra-orbital fat. Yet we do not dare perforate the sclera for fear of irritation of the ciliary muscle, and infection.

In the author's series of about 50 cases, all of them, so far as he has been able to observe, have discarded

(4) Texas State Jour. Med., April, 1925.
(5) New Orleans Med. and Surg. Jour., November, 1924.

glasses altogether following operation. The casual observer, and in many cases physicians have been unable to detect which eye had been operated upon unless quite familiar with the case. The cosmetic effect is striking.

Many factors are to be taken into account in order to obtain the exact correction. This is best done by measurements of deviation, muscle strength, error of refraction, general physical condition and development of extrinsic muscles as observed only when exposed.

The cases of divergent strabismus often have a weakened, thinned and undeveloped internus and a hypertrophied externus. In the divergent cases only six eyes as yet have been operated upon. Resection of externus and tentomy of internus are done.

Modification of Reese's resection is to pass a No. 10 silk suture into the muscle proximally to the Prince forceps, but not until the tendon has been divided at the scleral attachment, just the opposite procedure to that of Reese, but causing the severed edges of both stump and muscle not only to come together but actually bend at right angles to plane of sclera with their cut ends pointing outward. Not one of the cases showed any tendency to slip or relax in the least from underneath the stump. Sutures are passed through conjunctiva and 2 mm. from the limbus and tied securely. The tenotomized muscle is held in Prince forceps and a No. 3 silk suture passed through the muscle proximally to the forceps and into the sclera from 3 to 12 mm. from the stump and brought out and tied over the conjunctiva 2 mm. from the limbus. Done by the open method, it is necessary to close all conjunctival openings with No. 3 silk. Anchor either to bridge of the nose over several layers of adhesive, or strap over to the temple as the case may justify. This anchorage is best obtained by passing a No. 13 silk suture underneath the conjunctiva as close to the limbus as possible. Pressure bandages over both eyes are changed every 24 hours for three consecutive days. Large scleral sutures should remain

A

A—Before and after operation. Gained 15 pounds in four months. Right eye—V 20/200; left eye—V 20/20. Refractive error both eyes plus 5.50 sph.

B

B—Before and after operation. Right eye—V 10/200; left eye—V 20/20.—Whitmire, page 79.

A

A—Before and after operation. Gained 10 pounds in two months. Right eye—V 20/100; left eye—V 20/50. Refractive error both eyes plus 5.50 sph.

B

B—A case where remarkable improvement has been noted. Glasses have been discarded for all possible uses.—Whitmire, page 79.

in position from 12 to 30 days, owing to the amount of scar desirable at the attachment.

Local anesthesia is used for all cases except the excitable type. The youngest operated upon under local anesthetic was 6 years of age. No interruption on account of pain.

The discontinuation of glasses without apparent defect in cases of hyperopia as great as +4., is admittedly of extreme interest. (Plates VII and VIII.)

The Conjunctiva

Roseola of the Conjunctiva. There is a type of conjunctivitis seen in exanthematous diseases such as measles, smallpox, typhus and scarlet fever, usually preceding the skin manifestation. The pathologic changes in this form of conjunctivitis are analogous to those in the eruption of the skin. It is in reality a form of hyperemic conjuntivitis with red blood cell diapedesis, wherein it varies from the ordinary forms of conjunctivitis, in which the conjunctiva can be blanched by pressure or instillation of epinephrin. The conjunctivitis of the exanthematous type is characterized by its suddenness of onset, lack of discharge, some photophobia (not found in usual forms of conjunctivitis) and little or no lacrimation.

The symptoms develop in a subacute or chronic manner, with an itching and sometimes burning sensation of the eyes. This disease picture is so common in early measles that further description is unnecessary.

S. Morse[6] has recently observed several cases of exanthematous or roseolar conjunctivitis develop which could not be ameliorated by any of the recognized forms of treatment for conjunctivitis. In fact, the hyperemia had persisted for many weeks before he saw the cases, and with this history and other findings he found the cause to be syphilis, and cured it promptly by institution of antisyphilitic treatment.

(6) Jour. Amer. Med. Ass'n., Apr. 25, 1925.

Exanthematous conjunctivitis is often seen also in pityriasis and psoriasis, but, of course, the treatment is different. One of the cases reported was complicated by pityriasis, which the patient had had some time previous.

The patients in the cases reported never knew nor were informed of a syphilitic infection, and had no other evidences of it. The diagnosis of syphilis was made by the following suggestive symptoms. In most cases of this disease the onset was sudden but mild, and the course chronic or subacute, without any noticeable discharge, not even slight gluing of the eyelids in the morning. In other words, the eyes became red, at a certain time which the patient could definitely remember, but the symptoms were otherwise so slight that the affected patients did not consult a physician for some time.

The condition was ascribed to the usual cold.

When a patient has secondary syphilis, with its characteristic rash, this eye condition has been noticed by many as a by-product of the disease, and not much importance has been laid to it as a suggestive symptom of syphilis.

The cases selelected for report were referred by reputable physicians, with the history that the inflamed eyes would not improve under the ordinary treatment for conjunctivitis, as known; in fact, they would not have improved in the most competent hands unless the underlying cause was treated.

In these types of conjunctivitis, the ocular condition is similar in appearance and symptomatology to a form of traumatic conjunctivitis known as conjunctivitis actinica (sunburn) "Klieg eyes," which is common in arc welders and motion picture actors. But here the condition is transient, depending on removal of the cause. The latter condition is of similar pathology. It is a severe hyperemia, with some diapedesis of the blood elements.

Roseolar or exanthematous conjunctivitis is much

more common in a varied ophthalmic practice than the other ocular manifestations of syphilis externally.

In a varied practice of more than eighteeen years, the author has seen the condition rather frequently and has tried to describe it in detail, for general enlightenment.

The Cause and Treatment of Vernal Conjunctivitis. Assuming that vernal conjunctivitis is due to some foreign protein or irritant, A. G. Fort[7] presents some facts found in dealing with 30 cases of this disease, occurring in colored children, ranging from 21 months to 23 years of age.

It is known, he states, that during an attack of hay-fever there is always an increase in eosinophiles in the blood. Smears from the conjunctiva of these cases showed eosinophiles in seven out of sixteen examined. Blood examination showed a constant eosinophilia. No case showed less than 2 per cent., and eleven out of sixteen showed 4 per cent. and more. This would seem, therefore, to be a definite finding.

The author accepts the theory that vernal conjunctivitis is a kindred disease to hay-fever, and that the manifestations of this disease are caused by a hypersensitiveness of the conjunctiva of children to some foreign substance, most likely pollen, as this hypersensitiveness manifests itself during the pollinating period or season for grasses and trees. The plan as set forth by the American Hay Fever Association was followed and diagnostic skin tests with pollen were made and the reaction noted.

The cutaneous tests were made as follows: An area one inch by one inch on the forearm was scrubbed and a small area of epidermis removed with a sterile needle. Three small abrasions are usually made, one for the spring pollen, one for the fall pollen and one as a control. Where there was an increased hyperemia or a definite wheel the reaction was considered positive. All

(7) Jour. Med. Ass'n. Georgia, December, 1924.

of the cases so examined showed a positive reaction. The author then proceeded to treat with pollen extract as suggested by the American Hay Fever Association. Results have been uniformly good. Of the fifteen so treated there have been two cures, the other thirteen showing much improvement.

Conjunctivitis Infectiosa Necroticans (Pascheff). Since the original report of Parinaud, 30 years ago, on the type of conjunctivitis that has since borne his name, many cases have been recorded in the literature with this diagnosis. Some of them were of the same character as those reported in the original article, while others bore no clinical resemblance to this disease. Subsequent investigation has developed the fact that monocular infections of the conjunctiva, with glandular involvement, may be due to more than one cause.

A type was reported by Pascheff in 1916-1917, which he called "conjunctivitis infectiosa necroticans." H. H. Stark[8] has observed and reported upon four cases answering exactly the clinical description given by Pascheff.

These cases consist of induration and swelling of the pre-auricular, parotid and submaxillary glands, which have been followed by suppuration in three of the four cases. There was a rise of temperature, the eyelids were red and swollen, and on the tarsal and retrotarsal fold of the conjunctiva there were white spots the size of a millet seed, some elevated, others as excavated ulcers. Some of these spots would cicatrize while others would appear. There were no vegetations, follicles, or trachoma granules. The process in the conjunctiva usually lasted about two or three weeks, while the glandular affection may last from two to three months. Pathologically, Pascheff found polymorphonuclear leukocytes, tissue cells in active proliferation, and a peripheral zone of lymphocytes. Experimental inoculation of guinea-pigs with excised portions of the affected conjunctiva pro-

(8) Jour. Amer. Med. Ass'n., Dec. 13, 1924.

duced death in from seven to eight days. The inoculated animal showed in the spleen numerous white necrotic spots, which, by inoculation of the guinea-pig, produced the same conjunctival condition as found in the clinical cases.

He isolated in all his cases an organism which he called *Micrococcobacillus polymorphus-necroticans,* in size from 0.25 micron to 2 microns, with the shape usually of that of a small coccus, but sometimes that of a bacillus. In discussing these cases, he says that he considered experimental and histologic evidence to be of much more value than any clinical appearance, and that, to form the diagnosis, it is not sufficient to observe the white spots, but to produce the disease by animal experiments. However, he states that he has found the white spots present in cases which gave no result from guinea-pig inoculation.

Koch-Weeks Conjunctivitis. That this comparatively frequent form of conjunctival inflammation is not altogether a benign affection is attested by a report from June,[9] who investigated the subject during an epidemic of this disease. He saw 1,700 cases, and states that one in eight presented corneal lesions, and of these, one in three had perforations. If the disease was treated early with 1 per cent. silver nitrate and frequent irrigation, it was quickly cured.

Chemical Conjunctivitis. On the day following an instillation of atropin into a cataractous eye, Michail[1] noticed that the eyelids were red and edematous. Further instillations aggravated the condition, and the fifth day a gray false membrane covered the conjunctiva. Other mydriatics produced similar effects. A lymphatic infiltration showed polynuclear eosinophiles. It may have been a case of anaphylaxis of exceptional duration and sensibility.

(9) Arch. d' Opht., v. 41, 1924.
(1) Clujul Med., v. 4, 1924.

The Treatment of Parenchymatous Keratitis. The course of parenchymatous, or interstitial, keratitis is so tedious that every case is the subject of concern to both the ophthalmologist and the patient; and while it is true that no class of cases has received more attention since the relation of affections of the eye to systemic syphilis became known, the interest is perennial. Uhthoff, Spicer and others have deemed it worthy of their serious thought.

Burton Chance[2] discusses those cases dependent upon inherited syphilitic infection, and reviews the treatment of this distressing affection. Such a review should be of service, as it is many years since a systematic account of the disease has been undertaken, and none but an uncritical observer would declare that the therapy of it is at all satisfactory.

The interstitial keratitis which develops in those congenitally diseased may be understood to be the expression of the local reaction to a systemic infection, now known to be the spirocheta pallida. Therefore, the principles of treatment of the keratitis must be applied to assist in the evolution of the spirochetes, to effect their destruction and elimination, and to prevent the consequences of the inflammatory processes within the eyeball.

It is impossible to cut the disease short, for usually the keratitis runs its course in spite of all our efforts; yet the course is likely to be shorter and less severe in well nourished persons with healthy organs, and longest and worst among the starved and ill-nourished, especially those with tubercular joint affections present either before or after the outbreak of the keratitis.

One of the remarkable features in the clinical history of parenchymatous keratitis is the tendency for it to recover, so that in the end the cornea completely clears.

(2) Atlantic Med. Jour., November, 1924.

Despite this presumedly happy outlook the structures within the globe are susceptible to inflammation, which inflammation not only affects the sight but may lead to the destruction of the globe. In addition, it is almost invariable that the two eyes become affected, although seldom at the same time, for it is usual for the keratitis to appear in one eye and after a few weeks to be found in the other. In rare cases the interval between the attacks in the separate eyes may extend to several years. And further, relapses, from the incomplete elimination of the spirochetes, and recurrences, years after an apparent cure, from the exciting of quiescent residual organisms, frequently take place, which incidents are, as a rule, greater in their effect and more harmful to the sight than those which succeeded the initial manifestations.

All these characteristics of the disease require that the treatment should be both local and general. In addition, the regimen should be kept up long after the symptoms have abated and the case has seemed to be cured.

It is not necessary that the patient should be kept in the dark, indeed it would be better for him to live in the daylight, the eye being protected with dark goggles. It is above all necessary to maintain the general health and spirits of the sufferers by assuring them that they will eventually regain the use of their eyes. As soon as possible the patient should be encouraged to live in the open air and sunlight. The cure is greatly promoted by judicious feeding and regular exercise out of doors. It would be of great advantage if children could be treated in the country, where the dietary might be simple and fresh.

In severe cases, however, the patient ought to be kept in bed, when possible in a hospital, during the worst part of the attack.

From the very outset, small doses of mercury should be prescribed. Children thrive and gain weight while

they are taking gray powder, small doses of which can be given night and morning for weeks without the fear of ptyalism or other toxic symptoms. Instances of idiosyncrasy are not common, but we do meet with persons with whom the smallest doses disagree and, conversely, with others who take large doses for long periods with but little appreciable effect. Everything, therefore, depends upon the dose.

The general treatment should consist, therefore, of a long course of mercury in small doses, more or less frequently repeated. The "gray powder," hydrargyrum cum creta, with ipecac and quinin, is the least variable preparation of mercury, alternated with iodid of potassium; the syrup of the iodid of iron; or, in the ill-nourished, cod liver oil.

Mercury by inunction may act more speedily than by ingestion. A piece the size of a bean, or, to be exact, a weighed drachm, should be rubbed well into the skin for twenty minutes every day. Because the skin is likely to become irritated, a different part of the body—the inner surfaces of the thighs and the arms, the sides, the flanks, or the axillae—should be selected for each inunction. Action can be accelerated by a prolonged hot tub bath every third day, the body being well cleansed, after which the rubs are to be resumed. Intramuscular injections of mercury creams also are of distinct service and decidedly more cleanly and less troublesome to administer.

At the beginning of the disease an intravenous injection of a medium dose of one of the salvarsan preparations usually acts promptly in reducing the blepharospasm. Salvarsan sometimes causes a rapid and decided improvement; yet it should be clearly understood that it only prepares the way for mercury, which ought to be regarded as the mainstay of the treatment. It has no influence either in cutting short the attack or in preventing the second eye from becoming affected. Despite its great value in general syphilis, it obtains little or

none in this type of keratitis; indeed even in salvarsanized individuals the complement fixation reactions commonly continue positive. The substance may be suspended in milk and injected either intravenously or intramuscularly. In the more serious forms of keratitis accompanied by uveitis, they are improved by continued mercurials and salvarsan, or by the one alternated with the other. A series of from 8 to 12 intravenous injections of salvarsan, followed in a week by a long course of mercurial inunctions, may so build up the patient as to enable him to endure the discomforts attending the uveitis.

Salvarsan alone cannot be relied upon to prevent the manifestations appearing in the other eye. The combination of mercury and salvarsan offers a better chance than when either is employed separately.

Notwithstanding that they have no effect upon the spirochetal keratitis, the use of the organic arsenical compounds is of inestimable value because of the great effect which they produce in benefiting the general health. They strongly combat the anemia, and strikingly stimulate the appetite and the digestion, both during the period of the injections and for several months after. What results we might obtain if it were possible to administer these drugs in the very first days of the keratitis it would be only problematical to predict. It is indeed rare for one to be consulted before the sight has been disturbed, the patient uncomfortable, and while the eyes are but slightly inflamed.

In recent months a combination of bismuth and potassium has been used in the form of potassium and sodium tartrobismuthate, in an oil suspension, in which butyn has been added to deaden the pain. It is administered from ampules containing 2 c.c., or 20 cg. Twelve to sixteen intravenous injections, given every four to seven days, comprise a course. The method is painless, easy to apply and can be used when mercury can no longer be tolerated. Its use was begun so recently that one

cannot draw conclusions as to its superiority, or whether it has any advantage over arsphenamin and the mercurials. It would be of service where these substances cause stomatitis and other idiosyncrasies.

It ought always to be kept in mind that tuberculosis might coexist in any case and be a hindrance to the cure of the specific disease. Therefore, when the effects of the regimen established are slow in manifesting themselves, an examination for the presence of tubercles should be made and when present, appropriate treatment instituted.

The acute stage may last for months. Therefore, too much local treatment often causes discomfort and excites irritability of the skin. During the period of progression all irritants should be avoided and only soothing remedies prescribed. Solutions of boric acid, sodium hyposulphate, and carbonate are cooling and nonirritating. Hot applications, though sometimes beneficial, generally make the skin tender and increase the discomfort. Bandages and compresses should be avoided; the closed lids are the best covering and protection of the eye.

The majority of cases require atropin or some other mydriatic drug. Although atropin is not a specific in corneal inflammations, it is, however, of the greatest value in securing physiological rest, through its action on the intra-ocular muscles and the regulation of the circulation of the eye. It is required and indispensable when the iris is involved, because it prevents the formation of adhesions. Not seldom one is confronted by cases in which, after the most persistent use, the drug fails to effect mydriasis. In such cases the atropin has not been able to get into the anterior chamber through the inflamed cornea.

The action of atropin can be increased by being combined with cocain, which also serves to allay the pain, tenderness and irritability. Butyn, holocain and novocain, too, can be employed for their anesthetic proper-

ties. Atropin irritation and poisoning should always be watched for, as they cause great distress.

During the period of invasion by blood vessels which form to protect the cornea, growing in response to the activity of the spirochetes and to the toxins which they generate, alarming as the redness might appear, no attempt should be made to diminish the vascularity by peritomy or any other such devises, for by so cutting off the blood supply the absorption of the spirochetes is interfered with and also the integrity of the cornea jeopardized. The vascularity should indeed be encouraged, as by the use of dionin and by eserin. In certain cases where there seems to be a yellowish necrosis of the center of the membrane, eserin in a 0.5 per cent. solution favors the growth of vessels and tends to shorten the process. As soon as the mass has been penetrated by the vessels the solution should be withheld and atropin again used to secure full mydriasis.

Besides favoring the intrusion of the blood vessels, dionin, in 5 per cent. and 10 per cent. solutions, in salves, and even by insufflation of the powder, acts well in relieving pain and irritability, and late in the course seems to help in the clearing up of the opacity while the cornea is still permeated with vessels.

The author has not seen any benefit derived from subconjunctival injections of the various solutions of mercury, nor of salt and milk. Their employment in such cases as have been seen in the past ten years, would have been fussy and meddlesome.

Xerophthalmia. During the last decade a great many experimental investigations on nutrition have been carried out, proving undoubtedly that xerophthalmia is due to lack of fat soluble A vitamin.

J. MacBell[3] thus describes the appearance of a typical case, and reports one that came under his own observation. Under general dietetic treatment, with

(3) Southern Med. Jour., February, 1925.

cod liver oil, this patient showed daily improvement, and resulting fair vision.

In the typical case there is a failure to gain weight. The weight loss is progressive and the child grows to be quiet and apathetic. Usually the child is attacked by some intercurrent infection. This infection as a rule is simple catarrhal in type, yet extraordinarily persistent.

The eye lesion does not appear until late in the disease. The first symptoms are dryness of the ocular conjunctiva, which becomes wrinkled and shrunken. Later on, small yellowish white spots appear. The dryness later extends over the cornea and shortly bits of it become necrosed. In the majority of instances the ocular conjunctiva is infected. The conjunctiva is red and swollen and the eye begins to "water." Photophobia is very marked. In such cases it is quite difficult to distinguish the eye lesion on account of the destructive inflammation present. The scarring is always opaque in character.

Keratoconus. This rather infrequent anomaly is said to be more common in females than in males, and it has been observed that females who have keratoconus are chronic sufferers from menstrual disturbances such as dysmenorrhea and menorrhagia, and that they are also subject to dystocia and puerperal hemorrhages. Just why this is so or what the connection is, no one seems to know, but it is a matter of clinical experience. Keratoconus is usually bilateral, the condition being more advanced in one eye than in the other. The apex of the cone is usually a little below the center of the cornea. The length of the cone varies from a slight protrusion to three-fourths of an inch long.

J. W. Ellis[4] gives the following brief description of this rare condition, with a report of three cases seen by him, in one of which the vision in one eye was very much improved by the removal of a cataractous lens.

The disease is made known to the patient by interfer-

(4) Texas State Jour. Med., October, 1924.

ence with vision. The eyes become increasingly myopic and astigmatic so that all objects have to be brought very near in order to see them at all. This condition of compound myopic astigmatism may progress to a degree in which it is almost if not impossible to have properly correcting lenses ground. Conical cornea is seldom recognized in childhood and it usually develops between the twelfth and twentieth years. When the subject is viewed in profile, it is usually easy to make a diagnosis. On looking directly at the patient, the eyes are observed to have a peculiar, sparkling, diamond-like brilliancy. Some have likened this lustre to the sparkle or twinkle of large dewdrops in the early morning sunshine. With the retinoscope there is noted a very small reflex at the center of the cornea, which is surrounded by a dark circular shadow or umbo.

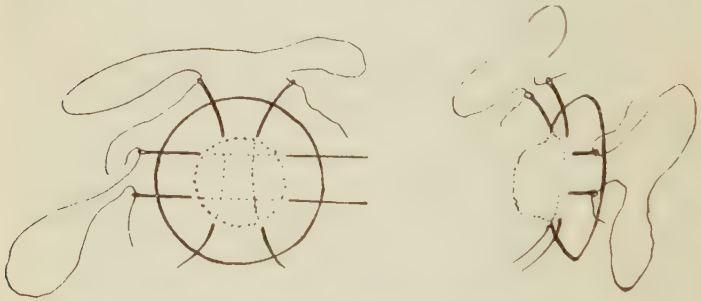
Ophthalmoscopic examination of the fundus in advanced cases is unsatisfactory, the image being so distorted by the conicity.

The precise mode of development of conical cornea has not been definitely determined. It is considered congenital like myopia and keratoglobus, as it is found in members of the same family and their descendants. Swanzy says, "The condition is due to gradual and slowly advancing atrophic processes in the cornea at or near its center, in consequence of which the normal intra-ocular tension acts on it so as to distort it into conical form." It is due to congenital weakness at the center of the cornea or to chronic degeneration of the membrane of Descemet. The apex of the cone is often reduced to one-third of the normal thickness.

No one can foretell to what extent keratoconus may develop nor at what stage the process may come to a standstill. There is not much hope of its getting better spontaneously; the probability is that it will get worse —and may do so even in spite of any and all therapeutic measures. However, if the patent comes for treatment early enough and is made to understand the seriousness

of the condition and follows the instructions of the oculist, he may hope to retain useful vision.

Success in the treatment of keratoconus depends very much upon the intelligent co-operation of the patient. The patient should be advised in every way possible how to protect the eyes. He should not be allowed to follow a profession or business requiring the use of the eyes for near small objects such as a tailor, writer, student, teacher, or the like. Treatment is both medicinal and surgical. The medicinal treatment consists in the use of astringent collyria and a miotic such as eserin, either with or without a bandage, and also in the administration of tonics and alteratives, such as iron and iodin.



A *B*

Fig. 10.—Young's surgical method of dealing with keratoconus. *A*, Front view; *B*, Profile.

The surgical treatment consists in the correction as far as possible of the high refractive error with appropriate lenses. These patients should be re-refracted often in order to keep up with any changes that may be taking place in the dioptric media. Excision of the apex of the cone has been practiced with some success. Extraction of the lens has been attended with good results, especially in cases when the myopia is around minus 10 or 12. Repeated discissions have yielded good results in the younger patients. Cauterization of the apex of the cone by the electric or actual cautery which,

as in excision of the apex producing a flattening of the cornea, has been done with good results. But after either of these procedures there is a central opacity of the cornea, necessitating an optical iridectomy afterwards in order to get the best results.

G. Young[5] devised an operation for keratoconus for the purpose of saving an eye which after an attack of pneumonia developed a staphyloma of the cornea, the size of a large pea, and seemed about to burst.

The cornea was transfixed by four needles which entered the anterior chamber outside the base of the staphyloma and issued at points diametrically opposite. For the two horizontal transfixions two ordinary fine sewing needles were used, but for the two vertical ones curved needles were necessary. Each pair of needles were threaded with the two ends of one suture. After fastening the needles, the sutures were tied firmly, constricting the whole staphyloma at its base, and then the staphyloma was sliced off by means of a keratome to one of whose edges a sawing movement was applied. There was no reaction. Within a month, the site of the excised tissue was represented by a stellate leukoma of regular contour. After optical iridectomy downward and inward, vision of 6/24 was obtained with +1. sph. —3. cyl. ax. 45°. (Fig. 10.)

The Iris

Aniridia in Five Generations. In the course of an examination of school children a few years ago, H. L. Dwyer[6] encountered a child with hereditary absence of the iris. Tracing her family and relatives, this observer was able to find nine cases of aniridia and obtain a good family history of fifteen cases in five generations. On a casual inspection of the eye, there seems to be a total absence of the iris, although it is probable that on close

(5) Brit. Jour. Ophth., June, 1924.
(6) Jour. Amer. Med. Ass'n., Nov. 15, 1924.

examination tags or remnants of this structure remain, as is reported in the majority of cases examined.

In this anomaly the influence of heredity is most strikingly seen. The character behaves as a mendelian dominant. (Fig. 11.)

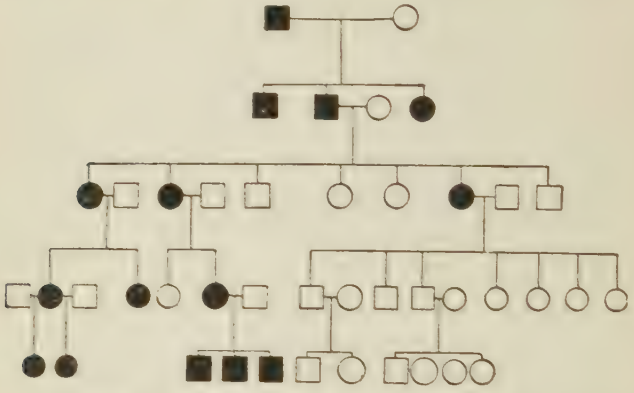


Fig. 11. Pedigree of a family with aniridia.

Although we are unable to work out the mendelian ratio in man, there are certain deductions that can be made from the families that have been reported. Davenport (*Heredity in Relation to Eugenics*) shows the pedigrees of three families with anomalies of the iris, and concludes that no woman with the defect should have children, since all sons will show the defect; and, should an affected man marry a normal woman, he will transmit the defect to all or to half his children. He believes that the defect is due to an inhibitor of development and that the affected male is either simplex or duplex in this inhibitor and the affected female typically duplex. In some of the families that he illustrates, affected children have sprung from unaffected parents in one of whom, of course, the defect was recessive or dormant.

In the pedigree here reported, all of the affected persons have an affected parent. In the fourth generation

the character disappeared in one family and has not reappeared in the children of this family. One daughter of the fourth generation has been married twice and has transmitted the defect to a child of each union. One of the children is in a school for the blind, and two from the other family are as yet attending public school, but with little result.

The facial aspect is characteristic, because of the efforts to shut out light. The palpebal fissure is voluntarily narrowed, the chin held down on the chest; photophobia and nystagmus are marked. There are no corneal opacities in the children, but these are present in all the adults.

Two babies have been born since these families have been under the author's observation both with aniridia, which was early detected at birth.

Argyll Robertson Pupil. Among 363 elderly syphilitics examined by Hess-Thaysen,[7] he found 43 cases of Argyll Roberston pupil. Among these 43 cases, in patients over 60 years of age, there was only one case in which, after an observation of three years, there were signs of progression of the disease. The author believes that the Argyll Robertson pupil may be the only manifestation of syphilis, lasting for many years, and that if the cerebrospinal fluid has been normal throughout the course of the lues, and the Argyll Robertson pupil is its only manifestation in a person over the age of 55 years, the prognosis is excellent, whether the blood Wassermann be negative or positive.

The Lens

The Non-Operative Treatment of Incipient Cataract. Even though surgical treatment is necessary in many cases, the medical treatment of incipient cataract is something ardently desired. J. W. Sanders[9] believes

(7) Inter. Survey Ophth., p. 139, 1924.
(9) Ill. Med. Jour., January, 1925.

that 60 per cent. of incipient cataract can be held in check, improved or cleared up entirely if seen early and properly treated.

The author believes that most incipient cataracts are produced by a systemic condition causing a ferment or toxic chemical that brings about hydration of the crystalline lens. Some cases, as those from arteriosclerosis or senility, may be sclerotic from the beginning on account of disturbed nutrition.

Degenerative changes necessarily take place in any or all after nutrition has been poor for a period of time. Believing in the hydration theory, due to ferments or toxins caused by systemic conditions and local disturbances, he tries to overcome or correct the systemic troubles, such as intestinal toxemias, Bright's disease, diabetes, and so forth, and to overcome or correct local troubles as far as possible, such as correcting errors of refraction, correct conditions of light, heat, and the like.

In addition, potassium iodid, syrup of hydriodic acid, trifolium compound is used internally for their alterative effect and to get the benefit of their absorptive action to assist in removing the effusion in the lens and with local remedies to cause absorption and to increase the flow of lens lymph.

Locally, there have been many remedies proposed and tried. Cineraria Maritima, the much advertised specific, has been useless in his cases. Iodid of potassium, iodid of sodium in 1 and 2 per cent. solution used as eye baths twice a day for several minutes have been beneficial. Calcium iodid either in solution or in ointment has given good results, probably on account of the dehydrating effect of the calcium and absorptive or dehydrating action of the iodid. With these, dionin ointment or powder is used twice a week at night for the osmotic effect. In many cases where there is excess of uric acid or where there is a rheumatic condition, in addition to trying to correct the systemic trouble,

remove any focal infection that we find and use the iodids internally and locally. A solution of sodium salicylate is used locally and in large doses, 60 gr. of sodium salicylate, twice a week.

The subconjunctival injections of cyanid of mercury or iodid is not used because of the pain, the reaction, the fear the patient has for using these and the frequency of the visits the patient would necessarily have to make. It has been found that the iodids and salicylates are found in the aqueous and in the crystalline lens in a short time after giving them internally or using them locally as an eye bath; then why subject your patient to the subconjunctival injections; besides the patient can use them in the home whenever the oculist thinks necessary.

The time is here when we can conserve useful vision in many cases of incipient cataract. Some of them can be benefited, progress of others halted and many cleared up if properly treated both systemically and locally in their incipiency or beginning.

Non-operative treatment for incipient cataract is roughly divided by Allen Greenwood[1] into four varieties: (1) the hygienic; (2) the use of local applications; (3) the use of electricity, radium and the *x*-ray; and (4) the use of lens antigen.

Under hygienic treatment are included all the efforts to improve the body metabolic processes, improvement in the functions of the digestive tract and the eliminative organs, improvemnt in the cardio-vascular system and the blood. In this latter, particular attention should be directed to the reduction of any abnormally high blood sugar content; and to those critics who claim never to have seen any good results from the non-operative treatment of cataracts he suggests that their experiences cannot have included many cases of incipient cataracts due to diabetes or included cases probably due to foci of infection. Under hygienic treatment also

(1) Amer. Acad. Ophth. and Oto-Laryr., September, 1924.

comes the advice we give our patients in regard to the use of the eyes and as to the avoidance of any undue strain of the eye or the ocular muscles. In the prevention of eye strain, too much stress cannot be laid on the necessity of properly fitted and adjusted glasses with fairly frequent re-testings. Reassuring the patients and encouraging them to hopefully follow out the treatment has a mental effect not to be ignored. That the hygienic treatment has alone been of great value in the hands of some of our best observers is amply attested by the writings of Risley and Jackson.

In regard to the effect of local applications, more has been written than about any of the other forms of treatment. A variety of drugs in solution, dropped into the eye or injected subconjunctivally, have their ardent advocates. From a description of the use of these various solutions one finds that the advocate is depending on their action to increase the circulation and hence the nutrition of the anterior portion of the eye, or is depending on their antiseptic action or on both. Of all the drugs, "and their name is legion," one, on account of its peculiar action on the lymph circulation of the anterior portion of the eye, has come to be used more than any other, namely, dionin. In using dionin one must never disregard the fact that the lymph vessels soon become habituated and do not respond to the treatment. Therefore, to get the desired effect repeatedly the drug must be used intermittently This is often forgotten and dionin ordered to be used continuously, with the result that only disappointment will follow from the treatment. To get a greater effect, dionin is sometimes used subconjunctivally. Of other drugs suggested, those most frequently mentioned are iodid of sodium or potassium, fibrolysin, nascent calcium iodid, iodolysin and tincture cineraria maritima and for subconjunctival injection bichlorid or cyanid of mercury or dionin. Some observers who

have used the cyanid of mercury injection have reported very good results from the treatment.

Of the treatment by electricity, radium and the *x*-ray, that by electricity has been the most exploited of any of the methods of non-operative treatment of cataract. The former custom on the part of ophthalmic surgeons of offering no treatment to their cataract patients resulted in such patients turning to men who offered to cure all cases of cataract by the use of electricity and thus avoid any danger of an operation ever being necessary. Some of these "cure all men" used a weak solution of atropin with each treatment to get some improvement in vision due to the enlarged pupil and thus encourage their victims to come back for more electricity. In the hands of competent observers, electricity, applied in various forms and ways, has not proven of much value. For a while the use of radium seemed to promise much and its application was carefully worked out by Cohen and Levin, and Franklin and Cordes, who reported encouraging results, but the test of time has already lessened the optimism of its advocates.

Recently, the use of lens antigen has been advocated and some most encouraging results have been reported by the leading exponent of this treatment, W. A. Davis.[4] In studying the cases reported by him, one finds that those included among the early ones apparently have secured benefit and the growth of the opacities retarded at least for some time. The later cases, which form the larger number, are too recent to base acceptable deductions on, and while some have shown improvement in vision and a lessening of some of the opacities, to claim that no future increase will take place in the opacities will only be warranted after a goodly number of years of careful observation of all the cases. The large number of injections found necessary in order to get results must be disturbing to

(4) Read before Amer. Ophthal. Society, 1924.

some of the elderly patients. He who would unthinkingly claim that this treatment with lens antigen will never prove decidedly helpful may some day find he is in the minority.

While some still express the belief that treatment is of no value, there are probably very few today who send patients, with vision blurred by lenticular opacities, away without any treatment. The accurate adjustment of correcting lenses is in itself a valuable method of retarding the development of the opacities.

There are few today who, suspecting the presence of diabetes, do not advise treatment of the underlying cause and who have not found an improvement in vision and an arresting of the process following a cessation of the glycosuria brought about by diet or insulin or both.

There are few today who, suspecting and finding some uveal disturbance, do not treat the underlying cause and note an improvement resulting.

We are all, therefore, wittingly or unwittingly applying a non-operative treatment for our patients who have come to us for relief of a blurred vision due to lenticular opacities. Many ophthalmic surgeons, besides using the practically universal hygienic method, are in addition using some of the other special methods with the conviction that something is being accomplished. Most of the observers, who like the author, feel that special treatment as well is of value, have found that certain types of opacity are more helped than others. A simple clouding of the nucleus is often not helped and this is also true of the radiating or wheel spoke lines of peripheral opacification. The cloudiness between the radiating lines is most often influenced and frequently disappears under treatment.

During the first twelve to fifteen years of the author's practice, no special non-operative treatment was given cataract patients, but during the past twenty years consistent efforts have been made along these

lines. During the whole of the latter period the author has carefully carried out the hygienic treatment and during the bulk of the time has consistently carried out the intermittent use of dionin. Sometimes the dionin is given to be used alternate weeks, but more often to be used two nights in each week. Saturday and Sunday being usually chosen as most convenient for the patient. The drug is used in a 1 per cent. solution which may later be strengthened if necessary.

In the types mentioned as being most often influenced there has been in a good many cases, a definite clearing in the lens as viewed with the ophthalmoscope and a corresponding improvement in vision. A careful drawing of the opacities is made at the first examination and new ones made as the opacities change. Frequently a vision of 20/70 is bettered so that 20/40 or even 20/30 is easily demonstrated. Such an improvement has only rarely been seen under the no-treatment plan. Such an improvement has frequently been maintained through a number of years, even to five or ten years. An improvement in vision and a retarding of the progression is more likely if, coincident with the use of the dionin treatment, there is an improvement in the general condition with an elimination of all foci of infection or abnormal blood states. It is therefore plain that general treatment should be combined with any form of local.

In a recent paper by G. F. Harkness, on "Incipient Cataract," there is much food for thought. He incorporates in the paper the answers received from a questionnaire sent to those occupying the chairs of ophthalmology in a number of the Class A medical schools of the country and tabulated the answers. Those who claimed that no line of treatment had been successful and those who claimed that some treatment was positively or at least possibly helpful were about evenly divided. It is interesting to note, on looking over the answers, that of those who had found that some local

treatment was apparently of help, the majority favored dionin. The majority of those emphatic in the statement that no treatment was of use did not state that they personally had given any of the most generally used methods a long and carefully studied trial. Such a study of a method requires many years and not a few months.

Operative Treatment of Cataract. Some excellent and helpful suggestions on dealing with complications at the time of operation and during the healing process have been presented by W. A. Fisher[2] who has probably had a larger experience in the intracapsular method of operation than any other American ophthalmologist. He says that most complications occurring at time of operation and during the healing process are preventable provided there is a skilled operator.

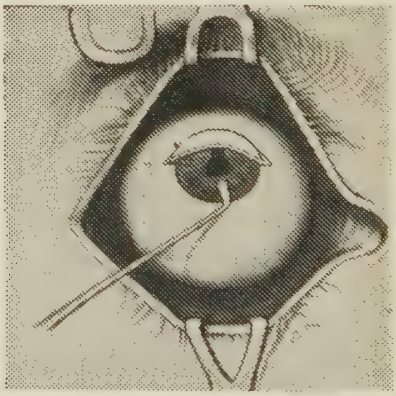


Fig. 12.—First position in lens delivery. Lid hooks in position.

a good assistant and the eye is well anesthetized.

An operator can only become skilful by practice and practice makes perfect. It is difficult, however, to obtain practice material and the operative results are

(2) Ill. Med. Jour., August, 1925.

often disastrous. Inexperienced operators can find excellent practice in every step of the operation, as well as in the handling of complications by operating repeatedly on the eyes of kittens six weeks old, which are easily obtained. The cornea of the kitten is about 11mm. in diameter and is quite like the human cornea. The anterior chamber is about the same depth as in the human eye and the iris is more like the human iris than that of any other available animal.

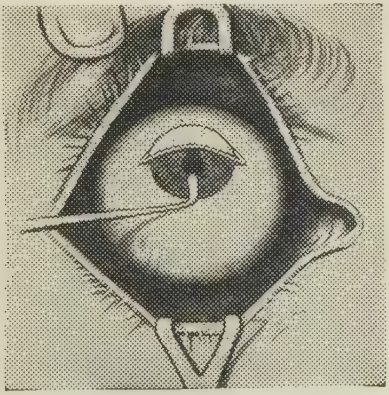


Fig. 13.—Second position in lens delivery. Lid hooks in position.

Assistant. The assistant's position is quite an important one and he, like the operator, can become quite proficient by practice. Nurses make better assistants than doctors because, not aspiring to become operators, they attend more strictly to the duty of holding the lids away from the eyeball. Nurses can practice by holding each other's lids; and, under supervision of the operator can in a very short time become quite proficient.

Selection of Patients. Beginners should select patients over 60 years old. Experienced operators also changing from a technic they are familiar with

to a new method, should do likewise; then if a complication occurs, they would be well advised to abandon the old procedure and proceed with the one with which they are familiar. A patient with a senile cataract that is half or more mature must have some operation to restore vision and there is not much selection to be made.

It is not possible to determine the size of a lens until an attempt is made to remove it, nor can one know how the patient will deport himself. It is necessary, however, to have an eye quite free from inflammation, lids fairly healthy, the pupils reacting to light, tension

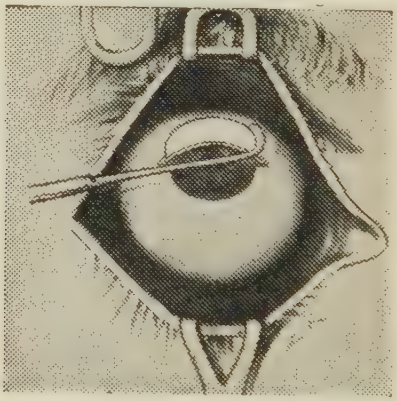


Fig. 14.—Third position in lens delivery. Lid hooks in position.

normal, the lachrymal sac free from pus and sufficient anesthesia to perform a painless operation.

Preparation of the Patient. Very little preparation is necessary, but it is well to make a 24-hour conjunctival culture. An ointment composed of 5 per cent. cocain and 5 per cent. eupthalmin is inserted between the lids of the eye to be operated upon, and the eye bandaged for 45 minutes before the operation.

Anesthetic. A few drops of 4 per cent. solution of cocain is then instilled in each eye. Five minutes after

this instillation the patient is taken to the operating room, where a second instillation of a 4 per cent. solution of cocain is instilled into the eye that is to be operated upon and in addition 5 drops of the 2 per

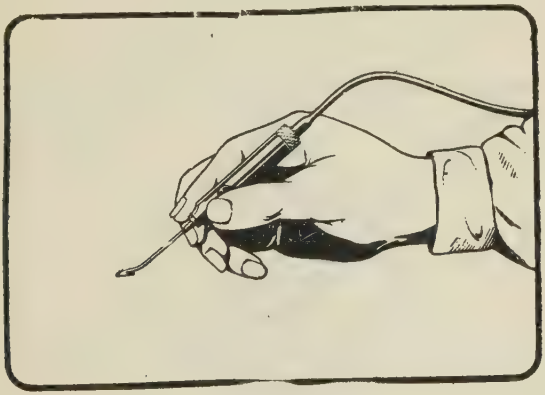


Fig. 15.—Position in which the Erisifaco should be held.

cent. solution of cocain is injected subconjunctivally at the point where the iris is to be cut. The face, eyelids and brow are then washed with soap and water. Soap entering the anesthetized eye is not annoying. Five minutes after the injection and second instillation of cocain a third instillation of cocain is made in the eye that is to be operated upon; and five minutes from the last instillation, or ten minutes from the time the patient is placed upon the operating table the eye is quite insensitive and a painless operation can usually be performed. If the patient is nervous it is well to postpone the operation one day and then give a hypodermic of ¼ gr. morphin three quarters of an hour before operating or at the time the cocain and eupthalmin are applied.

Lid Control. Deficient lid control is the cause of many complications. Lid hooks should be inserted before the operation is begun and a competent assist-

ant can be depended upon usually to hold the lids in such a manner that pressure is kept from the globe during operation. When the hooks are in position the eye is flushed with 4 oz. of 1:2000 warm bichlorid of mercury solution, which is not painful because the eye is anesthetized. Should some of the solution enter the unoperated eye, it will not be felt because this also is

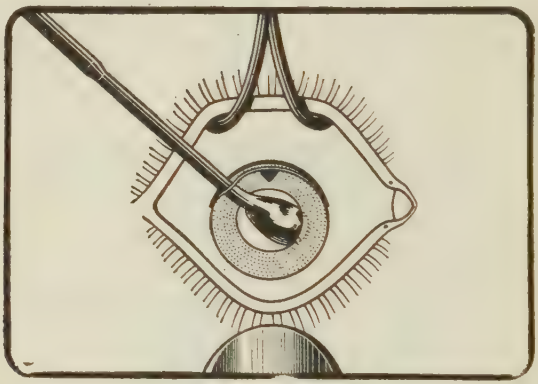


Fig. 16.—The crystalline lens is raised less than one millimeter towards the top.

anesthetized. The lid hooks are not removed until the operation is finished and the lids closed, at which time, they are slipped from beneath the lids.

Incision. A faulty incision may cause many complications, but with sufficient practice on kittens' eyes, one may expect a good incision, which should be just short of one half of the cornea.

Full Iridectomy. The purpose of an iridectomy is to prevent iris prolapse. If improperly done, it is often the cause of many complications and it must be executed with delicacy.

Peripheral Iridectomy. Many operators prefer a peripheral iridectomy, which is made for the same purpose as a full one. If a loss of vitreous precedes lens delivery the peripheral iridectomy should be converted

into a full iridectomy to facilitate spoon delivery.

Capsulotomy. The capsule is cut with a cystotome or a piece of it removed with forceps. The lens may be dislocated with either of these instruments and this would be classed as a very serious complication; a light hand is therefore necessary at this time. If the lens is to be removed in the capsule the capsulotomy is omitted.

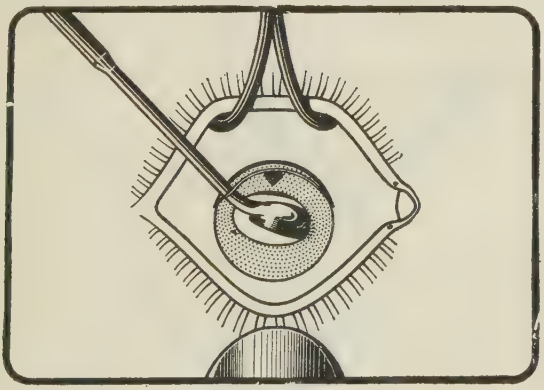


Fig. 17.—The movement of rotation commences in such a way that the superior border of the crystalline lens follows the patellar fossa from above downwards.

Lens Delivery. Most operative complications occur during lens delivery. In the capsulotomy method the lens is expelled by pressure in the same manner as in the Smith or Knapp intracapsular method. (Figs. 12, 13, 14.) In Barraquer's method the lens is pulled out by suction grasp. (Figs. 15 to 22 incl.) In Fisher's by the Smith method, except that in difficult cases the lens delivery is aided by a sharp needle. (Fig. 23.) In Verhoeff's and Torok's method by pulling upon the lens with toothless forceps, together with pressure upon the cornea. (Fig. 24.) If the lens cannot easily be expelled with safe pressure it is well to enlarge the opening in the cornea with blunt pointed scissors.

Cortex and Capsule. In the capsulotomy method it is quite necessary to remove as much of the cortex as appears safe to the operator. If the capsule is ruptured in the intracapsular operation, the cortex and as much of the capsule as can be done with safety are removed.

In removing cortical material the lid hooks are removed and a Smith speculum inserted, because a little pressure is helpful in removing the debris. There is danger of loss of vitreous in removing the debris, but

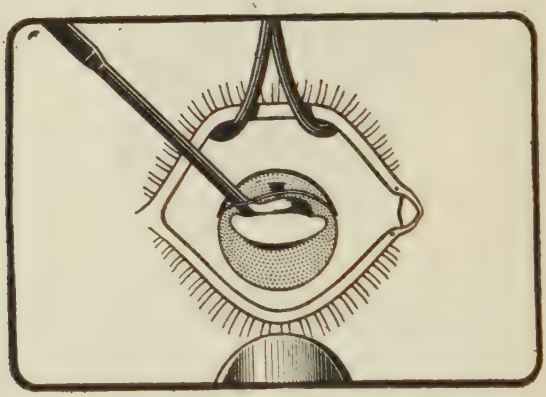


Fig. 18.—Represents the period when the crystalline lens has made one-fourth of the turn.

there is also great danger to the eye if it remains. It is advantageous to make the eye as clean as possible even at the expense of vitreous loss because of less post-operative complications.

Lost Lens. If the lens drops out of sight the eye is bandaged for four days, at which time the lens usually resumes its position. The incision is reopened as in a cataract operation and the lens removed with a Smith spoon. If the lens cannot be seen at first dressing, the eye is bandaged for four days, but no attempt at removal of the lens is made unless it can be seen.

Toilet. Poor toilet is the cause of many iris prolapses which are very often followed by postoperative inflammation. The spatula, according to Holland, should be moved away from the edge of the incision, and not toward it, to avoid pushing the iris into the wound.

After a full iridectomy 1 per cent. atropin ointment is inserted between the lids.After a peripheral iridectomy 1 per cent. eserin ointment is inserted.

Bandage. When the operation is finished 2 per cent.

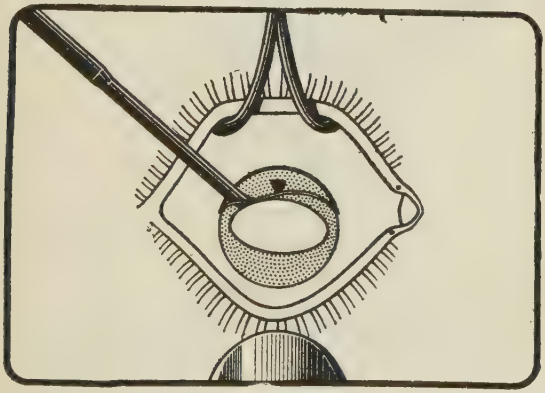


Fig. 19.—The posterior surface of the crystalline lens comes in contact with the posterior surface of the cornea.

yellow oxide of mercury ointment is applied over the closed lids, both eyes are bandaged and the patient is put to bed for 24 hours.

Complications After Operations. Many postoperative cataract complications have their origin in a defective operation. Prolapsed iris and its consequences probably cause more trouble than all other complications combined. Prolapse is more disastrous than slight vitreous loss; still many incarcerations and slight prolapses as well as slight loss of vitreous do not cause any loss of vision.

Gaping Wounds. When a gaping wound is found during the healing process there has usually been some complication during the operation. The cause is usually capsule or cortical material lodging between the lips of the wound, which should have been removed with any other debris during the operation.

Iridocyclitis. Iritis and iridocyclytis are the most common and dangerous complications during the heal-

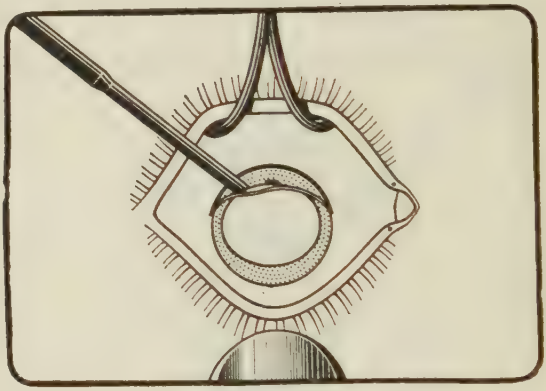


Fig. 20.—Represents the last period of rotation.

ing process and usually follow some faulty operative technic. Treatment must be energetic. Two leeches applied to the temple, an enema, ten grains of aspirin every four hours and mercural inunctions will often suffice in cases that do not require surgical interference.

Everted Cornea. Small incisions are probably the cause of more everted corneas than large ones. The cornea must be replaced if possible and a cut made with blunt pointed scissors at each corner of the wound, will be found very helpful. Lid hooks are quite indispensable in keeping all pressure from the globe while replacing the cornea.

Corneal sutures, or covering the wound with conjunctiva, are recommended.

Temporary Insanity. Dreams might be a better term than temporary insanity. They can be prevented or at least lessened by having one of the patient's friends sleep in the same room, in order to speak to him, if dreaming. The patient will often recognize the voice of a friend when the voice of a stranger might intensify his dream. Removing the bandage is also recommended.

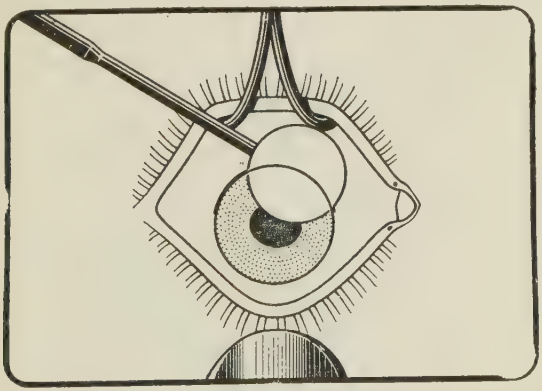


Fig. 21.—Withdrawing the instrument from the eye the cataract is removed completely.

Hemorrhage of the Choroid. The most serious complication that can occur during or after the cataract operation is hemorrhage of the choroid. Plus tension favors this complication; but it unfortunately occurs when all precautions have been taken and when the tonometer findings are normal. If, after a cataract operation, the patient complains of a feeling of faintness or severe pain or requests a glass of water, he should be given a hypodermic injection of morphin, anticipating a hemorrhage of the choroid. When it occurs the vision is always lost.

Infection. Col. Smith states that in his observations when infection sets in it progresses in spite of all efforts, but successes have been reported by Woodruff

following cyanid of mercury injections. Injections of milk, also typhoid vaccines as well as frequent instillation of optochin have been used extensively with favorable results, especially in anterior involvement of the globe.

After Treatment. Many complications during the healing process are due to too early and too frequent treatments. Objections have been made to the so-called "no after treatment" method, but probably more complications follow the daily-treated cases.

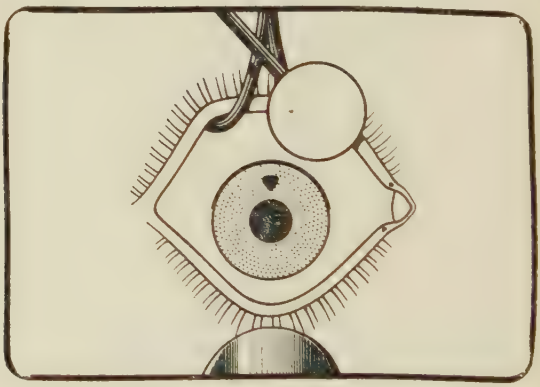


Fig. 22.—In terminating the extraction the pupil is black, central and round.

Very few complications are benefited by treatment other than that which can be given without opening the lids; and many serious complications can occur by too early and too frequent treatment. If the lids are not swollen no good can come from inspecting the eye for a week after the operation.

Conclusions. A good operator, a competent nurse, efficient lid control and proper anesthesia will prevent almost all complications that occur during the operation and healing process.

Debris. When the capsulotomy operation is performed less postoperative complications will follow

when cortical debris is removed. In doing this a loss of vitreous must occasionally be expected. When the intracapsular operation is performed with a ruptured capsule the cortical and capsule are removed to prevent postoperative complications during the healing process.

Vitreous Loss. Competent capsulotomy operators would seldom have vitreous loss were it not for their anxiety to clear the eye of cortical matter; but when this is done the percentage of vitreous loss is quite as

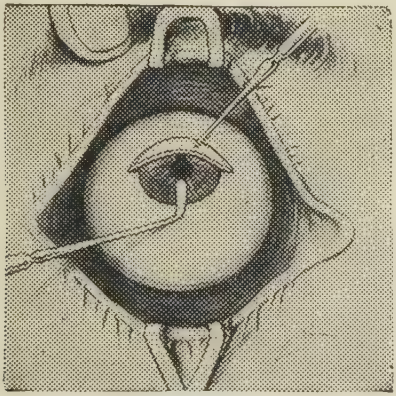


Fig. 23.—Fisher's Needle. Fisher's method of removing the lens when it refuses to be born, or when slight loss of vitreous has preceded lens delivery.

great as intracapsular operators report. The average operator will have less vitreous loss in the capsulotomy than in the intracapsular method; but the former will have more postoperative complications than the latter.

Experience. Experience can be obtained in every step of the operation by any method, as well as of all the complications, by operating upon kitten's eyes.

Experienced Operators. Suggestions for the prevention of complications during the operation and healing process will be expected from those who do large numbers of operations, such as is done in Holland's clinic

in Shikarpur, India, and Barraquer's clinic in Barcelona, Spain.

Helpful suggestions will be found in detailed reports of large numbers of operations such as Capt. Cruickshank's study of 2,755 operations from Holland's clinic, 1923-1924, to be published later; also 115 Barraquer's operations.

It is admitted by all ophthalmic surgeons that better visual results can be expected if the lens is removed within its capsule without complications; and this method offers the added advantage of the cataract being operable at any stage of maturity. For those

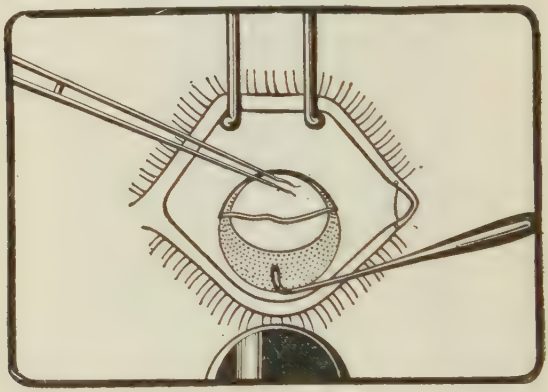


Fig. 24.—Verhoeff and Torok compress the cornea like Smith with the least pressure and at the same time withdraw the cataract with a pincette.

who desire to change from the capsulotomy to the intracapsular operation, Fisher's method is recommended because it enables competent operators to change from the capsulotomy to the intracapsular method without increasing complications.

Suturing of the Conjunctiva in the Cataract Operation. In no other important operation upon the body is a wound left to heal by itself without being sewed up, except in operations on the eye as for iridectomy

or cataract. It is true that in a well conducted operation immediate coaptation of the edges of the incision occurs and healing commences within a few hours, hence suturing of the cornea or the conjunctiva is not practiced by all opthalmic surgeons. Some, however, sew up the eye and thereby feel that certain operative accidents or secondary complications are not so likely to happen. H. V. Wurdemann[3] occasionally resorted to this procedure for 34 years but within the last three years has made it a routine part of this operation.

It must not be taken for granted that the use of the suture will compensate materially for lack of skill and experience, for the proper handling of the threads does require a certain amount of skill.

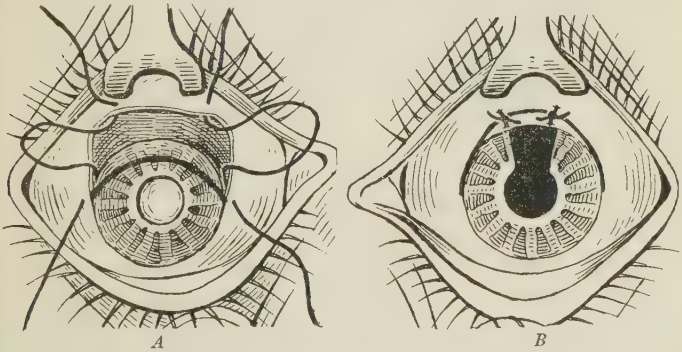


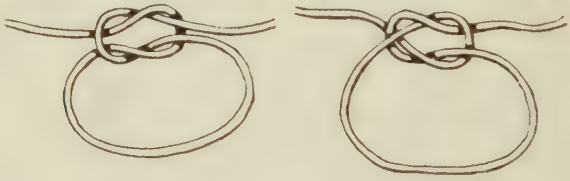
Fig. 25.—*A*, Conjunctival sutures for cataract extraction (Wurdemann). Method of placing sutures. *B*, Conjunctival sutures for cataract extraction (Wurdemann). Completed operation.

There are two methods, both adapted to placing the suture before as well as after the incision of the globe. The suture may be placed either before or after the iridectomy and extraction of the lens.

Method No. 1 is generally used by the author, as it is his habit to make a corneoscleral incision with a large conjunctival flap. Immediately after its completion two stitches of No. 1, braided, black, iron-dyed silk on

(3) Northwest Med., January, 1925.

very small needles are passed upwards through the conjunctival flap and the upper edge of the cut conjunctiva about 5 mm. apart, equi-distant from the vertical meridian. One-half of the knot is made with a large loop, the suture being placed to either side by the assistant; the iridectomy and the extraction are then done. In case of threatened or actual prolapse of the vitreous, the sutures are immediately tightened at any stage of the operation, whereupon the vitreous usually recedes into the eye. The suture is then completed by a "granny" knot. This almost invariably becomes untied, being found in the conjunctival sac or on the edges of the eyelids on the occasion of the first dressing, which is usually made on the fifth day. If the sutures have not become loosened, they may be allowed to remain for a week or more and are then



A *B*

Fig. 26.—*A*, Square knot: *B*, Granny knot.

readily removed by the forceps, as the knots are loose and the thread has to be cut very seldom. No infections of the sutures or the wound have occurred in the author's cases; the patients have never complained of any irritation; in fact, they are seldom aware that the eye has been stitched up. (Figs. 25, 26.)

Method No. 2. If the incision has been made through the cornea, which is very seldom the case in the author's practice, the sutures are then placed according to the method of Van Lint; from the conjunctiva at the lower angles of the incision to the upper edge of the cut conjunctive, 5 mm. apart; the iridectomy and extraction then being preceded with, as in the first instance; the conjunctiva being pulled down

over the wound, in fact covering about one-fifth of the cornea. This method was first devised by Van Lint for protection of the corneal wound against infections. The section of the conjunctiva may be made by the scissors before the incision of the globe and in cases of dislocated lenses the author has usually practiced this procedure. (Fig. 27.)

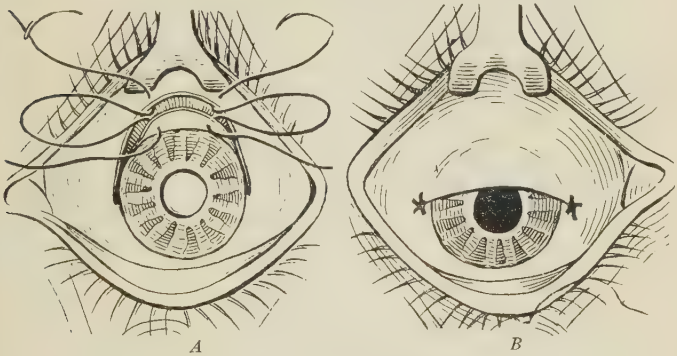


Fig. 27.—*A*, Covering of corneal incision in cataract extraction (Van Lint). Method of placing sutures. *B*, Covering of corneal incision in cataract extraction (Van Lint). Completed operation.

There are certain advantages in closing a cataract incision by suturing. (1) The toilet of the anterior chamber may be more thoroughly and satisfactorily made, even after the sutures are fully tied. (2) There is lessened tendency of iris prolapse or loss of vitreous and, if either occurs, the vitreous usually returns into the eye and the prolapse is readily replaced without further loss of vitreous. (3) There is lessened tendency toward breaking open of the wound with loss of vitreous and iris prolapse after the patient has been returned from the operation room to his bed. (4) The resultant astigmatism is less than where the wound is permitted to remain open or rather to coapt by itself. (5) The author feels that percentage of loss of vitreous and of iris prolapse is no more when the cataract is expressed in the capsule with the conjunctival stitch

as a retainer than when the capsulotomy operation is done. While this has been a routine procedure with him for only three years, he thinks that sewing up of the eye after such major incisions is a safeguard against accidents occurring both during and after the operation.

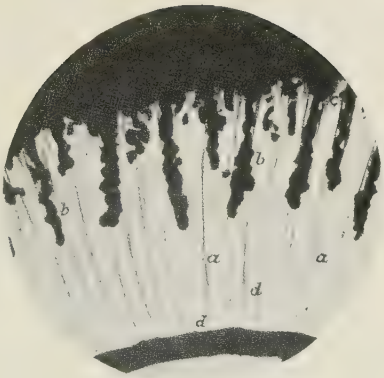
Intracapsular Extraction of Cataract. Three different methods of performing intracapsular extraction of cataract may be referred to as: (1) Pagenstecher's method—the spoon aided by external pressure; (2) Smith's method—external manipulation of the eye, occasionally aided by spoon or scoop; (3) Vard Hulen's and Barraquer's suction methods. After explaining briefly each of these three methods, A. H. H. Sinclair[4] describes a fourth method in which a blunt or toothless capsule forceps is used, a modification of Kalt's, which he devised in 1910.

It may be taken for granted that prior to operation every possible care has been taken to ascertain by all methods at our disposal, that the eye and its surroundings comply with the strict requirements of aseptic surgery. The state of the eye with regard to functional reactions is tested carefully in the usual way. The condition of the lens is examined with the pupil dilated, by focal illumination, with the ophthalmoscope, and with the corneal microscope, two or three days prior to operation. The type of cataract and the stage of advance are carefully investigated.

The lower margins of the blades of the forceps which come into apposition when the instrument is closed, have a specially designed curve, are smooth, and meet in a clamp-like manner. The shanks of the forceps do not meet, and all projecting parts are carefully rounded off, so as to cause no injury to the cornea or iris. The correct apposition of the blade margins is insured by "stops" on the handles, and too great pressure is prevented by an adjustable nut on one of the stops. The

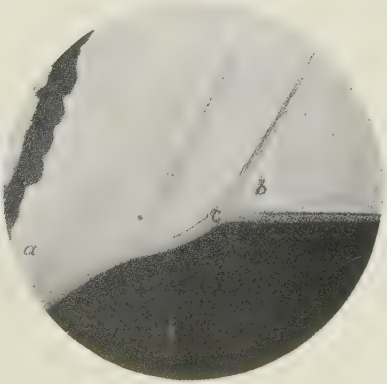
(4) Edinburgh Med. Jour., January, 1925.

A



B

C



D

Description of Plate IX on following page.

DESCRIPTION OF PLATE IX.

A—Drawing showing how the lens is held by the capsule forceps. Note the small mass of capsule-covered cortex filling the cavity of the closed forceps blades. Note the moulding of the lens and the tough and elastic capsule stretched by traction.

B—Frontal or coronal section passing by middle part of the processes:—(*a*) Posterior fibers grouped in bundles in relation to the ridges; (*b*) Their situation particularly on lateral aspect of the longer and shorter ciliary processes; (*c*) Unusually high insertion in the valleys behind the processes towards the orbicular portion of the ciliary body; (*d*) Their termination in tufts towards posterior aspect of the lens; (*e*) Absence of fibers of interfasicular union or of transversal fibers.

C—General aspect of portion of zonule (free portion):—(*a*) Hyaloid free from zonule, and canal of petit; (*b*) Anterior and posterior fibers limiting the pericrystalline canal; (*c*) Equatorial intra-canicular fibers; (*d*) Relationship of the base of the ciliary processes with the zonule.

D—Anterior insertions and pre-equatorial zonular fibers on the lens:—(*a*) Terminal fasiculi of anterior fibers, blending with the capsule without raising it; (*b*) Pre-equatorial fibers ending in a cone of drawn-out capsule; fibers blending with the superficial part of the capsule; (*c*) Deep layer of capsule independent of fibers but filling in raised-up portions.—Sinclair, page 120.

upper aspect of the closed blades forms a small spoon-shaped or boat-shaped cavity or cup. This is directed upwards when the instrument is in position, and can be clearly seen through the cornea. The lower aspect of the closed blades is convex and keel-like, and when the instrument is first placed in position rests lightly upon the central part of the anterior capsule of the lens. The capsule of the lens seldom gives way where the forceps take hold, and this is in part due to the construction of the instrument. The drawing (IX, *A*) shows the way in which the forceps act in holding the lens, and also shows how yielding and pliable the lens becomes.

Hitherto the author has always performed iridectomy, and immediately after iridectomy the forceps are used. The blades are introduced closed through the central part of the incision with the point tilted downwards so as to raise the edge of the corneal flap. As soon as the closed blades reach a position at, or a little beyond, the center of the lens, they are placed, still closed, lightly on the lens capsule and opened widely to 4 or 5 mm. During the opening movement the blades are held in light contact with the surface of the lens. The pupil margins, often seen in contact with the outer aspect of the blades, are gently pressed asunder, and the iris has never been seen to be injured in any way or caught by the forceps. When the opening movement of the blades ceases, the closing movement should begin without any delay, and as this closing movement begins the blades are gently pressed against the lens capsule. This gentle pressure is increased as the closure proceeds so that the convex edges of the clamping margins of the blades dimple or indent the capsule into the soft sub-capsular cortex of the lens. As the closing blades approximate, the pressure upon the lens is progressively increased, and at this stage it can be clearly seen through the cornea that a relatively large mound of capsule covered cortex is form-

ing between the blades. When the closure is complete, the cup of the forceps contains quite a considerable mass of capsule-covered cortex. This contained cortex distends the portion of capsule within the cup and during the traction which follows, prevents it slipping from between the lower margins of the blades, and thus too great pinching pressure upon the capsule is unnecessary. The construction and large size of the blades also help to spread or distribute the stain upon the capsule (Plate IX, *A*.)

The degree of approximation or pressure of the blade margins has been arranged prior to the operation by the setting of the adjustable nut on the lowest stop between the handles.

Immediately the forceps have been completely closed a gentle forward movement towards the center of the cornea is made, and the forceps held forward in this position for an appreciable period, say for five seconds or more. This first forward movement puts the lens capsule on the stretch all round and begins the moulding of the lens. When this forward movement is considered sufficient, the direction of traction is altered so as to bring the greatest degree of tension to bear upon one part of the suspensory ligament at a time (IX, *B*, *C*, and *D*). If we suppose the cornea to be marked like a clock face as viewed from the front, begin the lateral traction forwards and to the side, towards 2 o'clock, and afterwards towards 10 o'clock, and then towards 12 o'clock, always maintaining a partially forward movement. The suspensory ligament appears to give way at one part at a time, and always below the horizontal meridian. Once the rupture of the ligament has begun the subsequent separation is much easier, and the ligament seems to strip off from the lens margin. In cases where the zonule gives way easily, the above stages of the procedure may not be noticeable. At this stage, which is often about half a minute, but has varied from 10 to 15 seconds in one case to from 60 to 70

seconds in another, the lens begins to yield and to come forward at the lower part. This gives the impression that the lens has become free from its lower and lower lateral attachments. The forceps traction is constantly maintained, but with a little less strength, so as to bring the lens forwards and towards the wound very slowly. This slow, gentle, but continuous traction gives time for the separation of the remaining suspensory ligament attachments, and also for the gentle and slow separation of the lens from its bed upon the anterior surface of the vitreous humour. At this point, where the retaining power of the suspensory ligament has largely given way, the lens begins to abut upon the posterior surface of the corneal flap, and then on the margins of the wound. It has now become considerably altered in shape, this alteration varying in degree according to the consistency of the lens, which in its turn depends upon the type of cataract and the age of the patient. In certain cases it is remarkable to see how much of the intact capsule with contained cortex may be drawn, like the narrow end of a pear, into and even through the wound, prior to the successful delivery of the lens. The moulding of the lens in some instances suggests that the nucleus has altered its position in relation to the surrounding cortex. While this shows the toughness of the capsule and the suitability of the forceps, it is not desirable if due to a preventable cause, such as too small an incision. The lens having engaged in the wound is slowly drawn through, but must be so held that when its maximum diameter has passed out, it can be restrained from anything like a sudden, or even too rapid a completion of its exit. This is important, because it is one of the maneuvers which helps to prevent vitreous from following the lens into the wound. If the last third or quarter of the lens be held in the wound for a few seconds it appears to be finally pushed away by the resiliency of the corneal flap, which closes down behind it. In some cases after successful sublux-

ation with forceps, he has employed expression for the final removal of the lens and has found this a satisfactory method.

After the extraction has been completed and the conjunctival flap has passed into good position, as practically always happens, there comes the question of the freedom of the iris from the wound. Stroking of the cornea may suffice, but if necessary the repositor must be used. Atropin if not used prior to operation should be used immediately after.

The dressing is a small round of lint smeared with vaseline and placed over the closed eyelids. A round of gamgee tissue is put over this and fixed with a strip of half-inch plaster. Then over all is placed a perforated aluminum shield which is held in position by two strips of plaster. Both eyes are covered for 24 or 48 hours, after which the unoperated eye is left open and the operated eye has the dressing removed, leaving the shield only.

The following is a short note of the clinical results of 52 cases operated on with the toothless forceps described, the series including the earlier cases in which the forceps did not act so well as in the later ones. The notes of vision were taken soon after operation, though it was generally found that sight improved as time went on.

Of the 52 cases are found:

In 16 cases	6/6	vision	In 7 cases	6/18	vision
" 18 "	6/9	"	" 2 "	6/24	"
" 6 "	6/12	"	" 2 "	6/36	"

One of the cases with vision 6/36 had retinal hemorrhage at the macula, andone case lost the sight of the eye from severe infective iritis.

Vitreous loss occured in 7 cases. Vision in these cases was 6/9, 2; 6/18, 2; 6/24, 2; 6/36, 1, when taken shortly after operation. In the first 4 cases the loss of vitreous was slight and good vision was obtained; of the last 3, 2 had normal vitreous and 1 fluid vitreous.

all 3 had considerable losses and serious effect on vision was anticipated. Recently, however, 1 of the 2 above mentioned as having 6/24 vision, had improved to 6/9.

In 18 cases the capsule ruptured prior to complete delivery. This resulted in some of the cases in remnants of capsule and cortex remaining in the eye as in capsulectomy operation.

In 3 cases the toothless forceps failed to grasp the capsule, owing to the swollen lens rendering the capsule too tense. In these 3 cases capsulectomy was performed.

Of the 4 cases of iritis which occurred, 3 were in cases in which the capsule ruptured.

In intracapsular extraction by this method, the procedure is, to begin with, the same as that in the capsulectomy operation, excepting that the incision is slightly larger. Iridectomy when performed is the same. The introduction of the forceps into the anterior chamber of the eye is the same, but after this stage the technic is distinct from that of the capsulectomy.

The operation with toothless forceps described is the least traumatic of the intracapsular methods and the apparatus is of the simplest kind. In the uncomplicated cases the postoperative reaction is very slight. The sight is good from the day after operation and the ultimate result is very satisfactory.

When vitreous loss occurs, it occurs after the delivery of the whole lens, and is therefore usually smaller in amount. It is not so serious in its effects because it is smaller and because it is unassociated with remnants of lens cortex and capsule. Complete intracapsular extraction has very little associated iritis. The operation has undoubtedly great advantages in immature cataract.

The type of case which gives the best prospect is that of a patient well over 60 years of age, who promises to be steady, and in whom the cataract does not look white and intumescent. The operator should not per-

sist in traction upon the capsule with forceps when the zonule proves to be very tough, but should have recourse to capsulectomy.

Electric Cataract. With the advent of industrial medicine and the ever increasing use of electricity, W. S. Franklin and F. C. Cordes[5] feel justified in reviewing briefly the salient factors of electric cataract as observed in cases produced by commercial electricity. There have been numerous cataracts reported due to lightning; these they have not included in their study.

Considerable work has been done on electric cataract. The typical changes are fine, grayish dots in the cortex, with subepithelial opacities appearing more or less flaky in most instances.

In practically all cases of electric cataract, the burn has been on the face and near the eyes. As a rule, the globe nearest the burn shows the most marked pathologic change. These observers believe that in dealing with electrical burns about the face and eyes, the possible development of a cataract must be considered for a period of two years. In industrial cases, this possibility should be reported.

The lenticular changes of an electric cataract are rather characteristic, the anterior cortex together with the deeper layers of the lens being involved. The opacities as a rule are flaky, although sometimes finely granular.

The voltage causing electric cataract may vary from 220 to 50,000 volts.

The eye nearest the site of the burn usually showed the most marked changes.

Electric burns may cause serious changes in the globe without the production of a cataract.

The Relation of Hyperglycemia to Cataract. Cataract is associated with a diverse group of diseases, each of which has seemed to bear some causal, though undefined, relation to the changes in the lens of the

(5) Jour. Amer. Med. Ass'n., July 25, 1925.

eye. Diabetes, chronic nephritis with hypertension and arteriosclerosis, thyroid disease, acute infections and dental caries are among the so-called causes of cataract.

All the foregoing diseases have a common feature in that each shows a tendency to the development of a percentage of blood sugar above the normal.

In the study of diabetes it was early established that cataract was likely to occur as a complication. But while the number of diabetic patients developing cataract is high the number of patients with cataract who have diabetes is found to be as low as 1 per cent.

The condition with which cataract is most often associated is found in chronic nephritis with hypertension and arteriosclerosis. Blood sugar varies in nephritis but is high in some cases of nephritis, eclampsia, essential hypertension and arteriorsclerosis. The hyperglycemia in hypertension and nephritis seems to be distinct from a true diabetic condition.

In thyroid disease there is found an alimentary hyperglycemia.

In acute and chronic infections, including dental caries, traces of sugar are apt to appear in the urine.

S. Weir Mitchell, in 1860, while studying the effects of injecting excessive amounts of sugar into frogs, found that cataracts had been produced in a number of the animals. These cataracts were produced rapidly in from ten to twenty-four hours. In some cases the cataracts would disappear if the frog was soon after given large quantities of water or was partly immersed in water; in other cases, the cataracts persisted.

Mitchell though that the cataracts were produced by osmosis—either by the withdrawal of water from the lens or by the increase of sugar in the lens. He considered that the development of cataract in diabetic patients bore no relation to this rapid development of cataract in the frogs; but he adds: "It is possible that the long continued presence of even a small amount

of sugar in the blood may cause in the crystalline lens osmotic changes productive of opacity."

Because of the fact that a patient with a cataract had a high blood sugar, although she did not have glycosuria or any other symptoms of diabetes, Helen Baldwin and Elsie Barthel[6] began a series of observations about four years ago. A table of records represents the percentage of blood sugar as found in 132 consecutive cases of cataract.

Ninety-nine patients out of 132 examined have a percentage of blood sugar above 0.12; that is, including the traumatic cases, 75 per cent. of the patients examined had the blood sugar above 0.12 per cent.

The number of cases examined is far too small for one to conclude that a similar ratio would hold in another group.

The cases presented in this series are too variable as well as too few to present in other than a preliminary report.

When diabetic patients with cataract are placed on a rigid antidiabetic regimen, the cataracts have been noted as becoming retarded in their development, or arrested, or in a few cases as having in a measure cleared. They have hoped that in the same way, when patients with cataract associated with hyperglycemia from any cause are treated by diet or in other ways so as to reduce the percentage of sugar in the blood, the development of the cataract might be retarded.

Ectopia Lentis. Congenital dislocation of the lens is a very rare condition. Knapp saw only ten cases in 50,000 patients.

Etiology. Heredity plays a great part. As to pedigree,—out of marriages of 22 affected and non-affected parents seventeen were affected, proving a ratio of almost three to one.

Other causative factors are rupture of the suspensory ligaments in utero, developmental defects, and

(6) Jour. Amer. Med. Ass'n., Sep. 24, 1924.

retraction of the vitreous. According to the theory of Badal and La Grange all such eyes are myopic and the lens is too small in size for space it should occupy. As a result the over-stretched zonula yields and the lens is displaced into the direction of least resistance.

M. L. Folk[7] reports three cases observed by him in the past three years.

Associate Pathology. This may include ectopia of the pupil, errors of refraction, particularly astigmatism, fundus changes, coloboma of iris, choroid or ciliary body, aniridia and nystagmus. The patients are generally intelligent and well.

Prognosis. Doubtful. Usually there is no change of condition. The capsule of the lens is seldom ruptured and the latter remains transparent. Spontaneous dislocation, cataract and glaucoma may occur.

Treatment. There is very little that can be done for these cases. If glasses improve vision they should be prescribed. If the lens becomes opaque, or if the diplopia is annoying, removal of lens should be attempted. This, however, is very difficult. In early life discission is to be preferred.

E. W. Kennedy[8] in reporting a case of ectopia lentis, reviews the causes of developmental defects permitting this condition to ensue. It is, he says, during the second week of embryonic life that the primary optic vesicles become visibly differentiated and appear as offshoots of one of the primary brain vesicles, the forebrain.

The Retina

Thrombosis of the Retinal Veins. There is still room for investigation as to the real etiology of this affection, as there is no means of distinguishing clinically what lesion is present in any given case.

(7) Ill. Med. Jour., April, 1925.
(8) New York State Jour. Med., Jan. 30, 1925.

M. L. Lerner[9] reports a case that came under his observation, where there was complete obstruction of the central retinal vein due to endophlebitis, and followed by marked secondary glaucoma. Some important aspects of this condition are reviewed by the author.

Three possible factors, he states, may be considered in the production of thrombosis of the retinal veins.

1. Infection, either bacterial or possibly a toxin bacterial in character or a product of metabolic changes.
2. Change in the vessel wall favoring thrombus formation.
3. Alteration of the blood elements.
4. Combination of any of these conditions.

These cases occur usually in elderly people. Among 60,000 patients in Haab's clinic there were 20 cases of thrombosis of the main venous system, of whom 15 were between the ages of 50 and 80 years.

Infection or toxemias during a life time may hasten all these changes in the vessel wall and therefore we must always look for the infectious origin.

Influenza seems to be a factor in favoring thrombosis of the retinal veins. Focal infection undoubtedly plays an important part in many cases. It is believed by some that a toxic influence is responsible; the toxin acting on the delicate macular choroidal capillaries, causes degeneration of their walls and in this way increases permeability to fluid end consequent edema. The fluid then diffuses through into the potential space between the rods and cones and the pigment epithelium, preventing the access of nutrient material from the choreocapillaris, so that the adjacent retina degenerates and form a hole. This explains the association of a hole in the macula with thrombosis of the veins in the same case. Stagnation of the blood current, and heart disease are also mentioned as causes of thrombosis.

The most important fact in the production of throm-

(9) New York State Jour. Med., Mar. 6, 1925.

bosis of the retinal veins is probably that simultaneously with general or local arteriosclerosis, the circulation of the eye is disturbed and to this is added a weak cardiac action that favors venous thrombosis.

Usually the favorite seat for the lodgment of thrombi is either at the lamina cribrosa or a short distance behind it. The place where the central vein makes its exit from the nerve is also stated to be a favorite place from the obliquity of the course of the vessel in this position.

As to prognosis a distinction must be drawn between the cases that are essentially obstruction of the artery or its branches and those that are obstruction of the central vein and its branches. The blood current in the artery carries the obstruction from the arterial wall through the larger lumen into the smaller, increasing the obstruction. In the vein, the blood current carries the obstruction away from the smaller vessels to the larger, and therefore, there is a better chance for partial or complete recovery.

The author arrives at the following conclusions:

1. Thrombosis of the retinal veins should not be confounded with other hemorrhagic affections of the retina.

2. Thrombosis of the retinal vein is due unquestionably to some definite etiology not established yet.

3. Infection must play a part in producing thrombosis of the retinal vessels in a patient whose vascular system shows sclerotic changes.

4. Cases that are classed as thrombosis of the retinal veins and reported as recovered as to vision and integrity of the eye should be carefully studied as to whether they do not belong to some other group of diseases of the eye.

Angiosclerosis of the Retinal Vessels. Angiosclerosis of the retinal vessels is so intimately associated with general sclerosis that its knowledge to the general practitioner is of extreme importance in the diagnosis and

treatment of this condition. It is from this point of view that E. H. Holt[1] here considers this subject.

The three greatest causes of sclerotic changes in the blood vessels are:

1. High blood pressure.
2. Toxic conditions.
3. Senile changes.

Of these, high blood pressure is often first discovered by ophthalmologists, as many of its symptoms are confused with eye-strain and because so many individuals between the ages of 40 and 60, the common age of its occurrence, consult us for the purpose of prescribing for presbyopia. The detection of hypertension is of the utmost importance, for it is often one of the earliest signs of arteriosclerosis, and if not a direct cause is at least associated with conditions which lead to vascular sclerosis.

The signs of hypertension which are most impressive are the small size and pale color of the arteries and the absence from the veins of the light reflex a short distance each side of the crossing by an artery. Unfortunately these signs are not always present so that many times it is not always possible to detect increased blood pressure from the retinal vessels.

The changes of angiosclerosis may occur in nearly all the retinal vessels, but perhaps more frequently they are seen in a single system or even in a single vessel. The cardinal signs of these changes are:

1. Variations in the caliber of the arteries, especially sudden diminution for a short time, passing again into normal size; a common and important sign, particularly if accompanied by general diminution of the size of the arteries. At times the vessels have a beaded appearance.

2. Alteration of the normal light reflex. Often it is increased physiologically, but the hard, sharply defined bright reflex present in places along the course of the

(1) Maine Med. Journal, February, 1925.

vessels is the important sign and usually indicates high blood pressure.

3. Loss of the translucency of the arterial wall. This hides an underlying vein so that it looks as if a piece had been taken out of it. In more advanced changes in the walls the arteries will appear as white lines. Both these conditions indicate severe sclerosis.

4. Tortuosity of the arteries. The presence of this sign is not so valuable as it is seen normally. However, the corkscrew appearance of the smaller vessels are quite suggestive.

5. Indentation of veins by arteries crossing over and under them. This varies from a slight pinching to a great obstruction with resulting stasis, thrombosis, edema and hemorrhage.

6. Hemorrhages. In the presence of high blood pressure, and if not due to local disease, these are of serious prognostic importance.

7. Edema of the retina. Usually localized and not commonly present.

The significance of retinal angiosclerosis cannot be overestimated in a consideration of general vascular disease and especially of cerebral vascular disease. General arteriosclerosis shows evidence of this condition in the retinal vessels in 50 per cent. of the cases, whereas the percentage is increased in cerebral sclerosis. Knapp says "the presence of sclerotic changes in the retinal vessels presupposes with certainty a similar state in the cerebral vessels but not the reverse." If this is true, think how valuable this information is to the general practitioner and to the patient, especially as many times the eye symptoms are in advance of or overshadow the general symptoms so that the ophthalmologist is first consulted.

The prognosis, when angiosclerosis of the retinal vessels is found, is serious not only to the eyes as visual organs, but more serious to life itself. The determining

factors as to the expectancy of life, are age, involvement of the heart and kidneys.

The duty of every ophthalmologist when angiosclerosis of the retinal vessels is found is to advise the patient to have treatment under the supervision of a general practitioner, to make the patient realize the importance of this treatment, to give proper instructions as to the care of the eyes, and when needed to give as much assurance as conditions will allow.

Careful fundus examinations should be made as regularly as physical examinations, not only for their diagnostic value but for observation of treatment, as they give exact information of the circulation, especially of the smaller vessels, obtainable in no other way.

The Significance of Albuminuric Retinitis in Chronic Renal Cirrhosis. It is a commonly accepted opinion that the onset of albuminuric retinitis in the course of renal cirrhosis means a death sentence to the patient within a comparatively short time. There is, however, nothing in the fact that the retina has become affected to explain the danger to life. The pathological changes can be seen, but that adds nothing to their gravity. As far as life is concerned it is the cause of the trouble that really matters, and any sign which shows that a disease is progressing indicates danger. Nevertheless, it should be remembered that no single sign or symptom, when taken as an isolated fact, is of much value either in diagnosis or in prognosis. Every disease must be studied in its whole symptomatology, because prognosis depends upon the association of the clinical phenomena. Symptoms that are helpful in diagnosis are not of equal value in prognosis. The general perspective of a case of renal cirrhosis, therefore, should never be disturbed by assigning to the ocular symptoms an importance out of all proportion to the others. The changes in the retina must be regarded as part and parcel of the general disorder, and must be viewed in their due relation to the whole. It frequently happens

that a patient, who is suffering from renal cirrhosis, although he is not aware of the fact, consults an ophthalmic surgeon on account of failing sight. In these circumstances it is the discovery of the retinitis that directs attention to the kidney, and the ocular lesions are part of a pathological picture, which includes renal cirrhosis. The patient, however, is chiefly concerned about his sight. He is not conscious that there is anything else the matter with him, consequently he does not suspect that the disease discovered by the ophthalmic surgeon may prove fatal. Prognosis in renal cirrhosis must, however, as pointed out by A. Maitland Ramsay,[2] always be considered in this twofold aspect.

1. *Prognosis with regard to Sight.* Speaking generally vision is not usually lost completely as a result of albuminuric retinitis. In a particular case the prognosis depends upon the site of a hemorrhage and the extent of vascular degeneration. If, as so often happens, the macula is implicated, the patient will be unable to read or to recognize a friend on the street, but the peripheral field of vision may be quite intact. It is the central area that is lost, consequently the patient sees nothing directly in front of him. A hemorrhage in course of time will be absorbed, but if the cause of the disease is not removed it is prone to recur, and even in favorable cases the effusion of blood may have damaged the macula beyond the power of complete recovery. In a similar manner a hemorrhage into the outer layers of the retina injures the layer of rods and cones, causing a blur in different parts of the field of vision. On the other hand, hemorrhages may occur in the inner lays of the retina—flame-shaped hemorrhages in the nerve fiber layer—and, unless they are situated at the posterior pole of the eye round about the macular region, the patient may be unconscious of their presence. Vascular degeneration is more dangerous to sight than hemorrhage, because it is almost invariably progressive, and vision

(2) Practitioner, May, 1925.

becomes steadily more and more impaired as the arteriosclerosis increases.

2. *Prognosis with regard to Life.* It should be remembered that albuminuric retinitis never occurs either in so-called functional albuminuria or in albuminuria due to simple passive congestion of the kidney, the result of functional inefficiency of the heart. It is rarely seen, moreover, in a first attack of acute parenchymatous nephritis, but on the other hand it occurs very often when acute symptoms supervene in the course of chronic renal cirrhosis, *i. e.*, when an acute phase is grafted upon a chronic condition. The main points to keep in mind are that albuminuric retinitis is always a late manifestation in the course of nephritis; that as a rule it is associated with the phenomena incidental to high blood pressure, and that its onset is determined by vascular degeneration or by acute general toxemia or by a combination of both of those conditions. In the cases in which signs of vascular degeneration predominate the prognosis is always grave, because the morbid changes in the blood-vessels are steadily progressive, not only in the arteries of the retina, but also in those of the brain, the kidney, and other parts of the body—general arteriocapillary fibrosis. On the other hand, where the signs of acute toxemia predominate a favorable prognosis may be given whenever it is possible to remove the cause of the toxemia, *e. g.*, toxic retinitis of pregnancy. Numerous cases of recovery from albuminuric retinitis are on record, but their interest depends not so much upon the disappearance of the ocular lesions as upon the fact of the removal of the cause operating both in the eye and in the kidney.

Detachment of the Retina. One hundred and twenty cases of detachment of the retina are described by Heine,[3] who states that the condition was caused by myopia in 37, injury 26, cyclitis 15, tumor 7, choroiditis 6, diabetes 2, struma and retinitis each 1, and several

(3) Klin. Monatsbl. f. Augenh., v. 72, p. 305, 1924.

conjoint causes 5. For some cases of myopic detachment simple mechanical stretching, for others shrinking of the vitreous, and for others again desquamative processes of the ciliary epithelium may be responsible; and similar changes may take place in the pigment epithelium of the posterior part of the eye. Precipitations on the posterior surface of the cornea and the so-called iritis in myopic detachment may possibly point to infections, *e. g.*, tuberculosis. Sixteen eyes of this group showed signs of cure. The sooner the re-attachment occurs, the better are the prospects for function.

The Optic Nerve

Congenital Anomalies. A case is cited by Cords[4] in which one optic disc was three-fifths the size of the other, associated with marked amblyopia, strabismus, color-blindness, deficient vascularization, and an apparently normal field. There was no other anatomical difference between the two normally shaped globes. Ar-

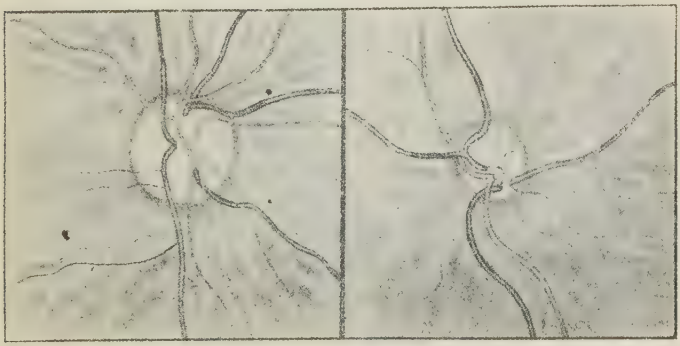


Fig. 28.—Case of marked inequality in size of optic discs.

rested development is suggested as the cause. Such anomaly is frequent in anophthalmus or microphthalmus, but does not often occur in eyes of normal shape. (Fig. 28.)

(4) Klin. Monatsbl. f. Augenh., v. 71, p. 414, 1923.

The Ocular Signs of Some Brain Tumors. Tumors of the brain have been recognized for many years. The more exact routine ophthalmoscopic study has opened many a dark symptom complex to the bright light of neurological examination, so that no case of suspected intracranial growth is thoroughly examined until the ophthalmoscope has been skilfully used, *x*-ray carefully applied and the profound knowledge of the neurologist brought into action. In the last 25 years, the literature has been replete with case histories.

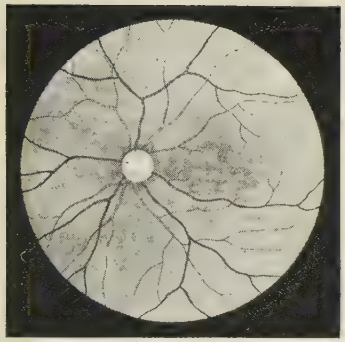
A. J. Bedell[5] reports the following cases, all of which have been proven by operation or autopsy and are, therefore, removed from the realm of conjecture.

Temporal Lobe Gliomas. By comparing the fields of vision you will note their similarity. The fundi even in the presence of very large tumor masses showed no gross deviation from normal.

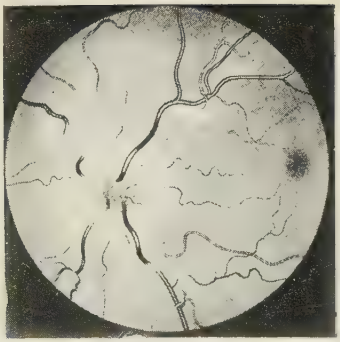
J. M., a man 23 years old, was seen for peculiar attacks lasting only a few seconds during which he gets up, becomes intensely pallid, walks around the room uneasily with an anxious expression and dilated pupils. Such attacks may come on several times a day or he may go several days without any. Two such attacks were observed and they were characteristic of 'le petit mal.' The objective findings at this time were absolutely negative throughout, including eyegrounds. He was given a combination of bromid and luminal and returned for examination about one month later, but stated that no improvement had taken place and, although urged to faithfully continue under observation, decided to stop the medication. When seen more than two years later, the vision of the right eye 20/20 and Type 1 with moderate degree of hyperopic astigmatism. Pupil 4 mm. regular, active, media clear. Fundus negative except venous engorgement. The right eyeball was 1.5 mm. more prominent than the left. The left eye 20/20 Type 1. Pupil reactions and fundus appearance similar to

(5) New York State Jour. Med., Jan. 30, 1925.

PLATE X.

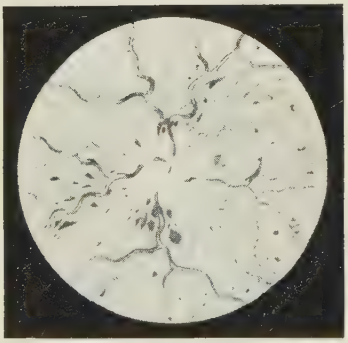


A



B

C



D

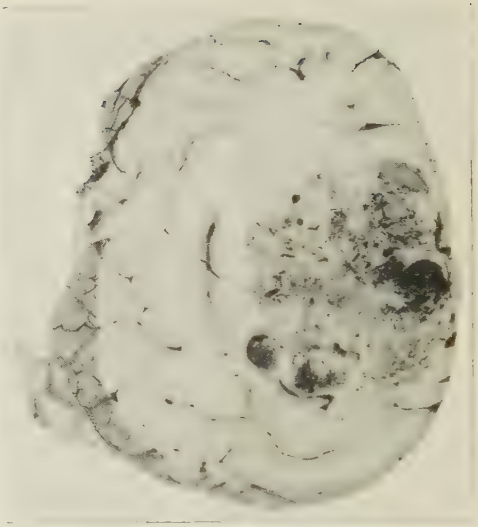
A—Tumor of the right temporal lobe, normal fundus.

B—Lesion of corpus callosum and occipital lobe. Optic disc swollen 6 diopters.

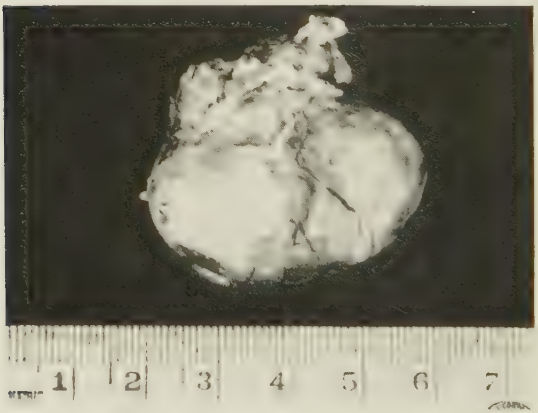
C—Optic nerve swelling, in a case of acoustic tumor.

D—Fundus appearance in a case of chronic serous arachnoiditis.—Bedell, page 138.

A



B



C

A—Fundus appearance in a case of cystic glioma of the right temporosphenoidal lobe.

B—Cystic glioma in temporosphenoidal lobe.

C—Acoustic tumor.—Bedell, page 138.

the right. Because of his mental reactions, the field of vision and the partial left facial paralysis he was advised to have another general examination. (Fig. 29.)

This revealed gross evidence of advanced cerebral disease; left-sided hemiparesis predominating in lower face and upper extremity, total left sided hemianopsia, gross loss of position sense, tactile sense and stereognosis in the left hand, slight ataxia of left upper extremity, increased tendon jerks on the left side, with classical Babinski phenomenon. The eyegrounds were still negative beyond fairly definite engorgement of retinal veins. Diagnosis: tumor (presumably infiltrating diffuse glioma) of right temporal lobe. (Plate X, *A*.)

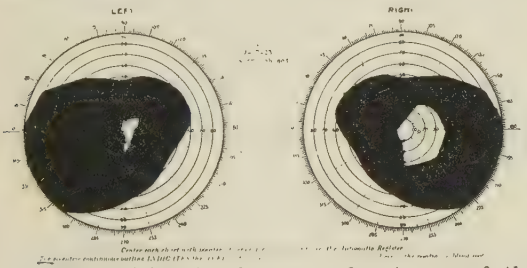


Fig. 29.—Field vision in the case of a tumor of the right temporal lobe.

Cushing reported that a large, partially cystic glioma filled the entire right temporal lobe. He did a radical excision of almost the entire lobe and followed it by *x*-ray treatment. The patient died about a month later.

A. C., 40 years of age, said that four weeks before his first visit he had noticed that he was running into objects, and about a month previously he complained of headache which he ascribed to a cold. At that time, he had positive albumin with casts which, however, cleared in a few days, although his headache persisted. Glasses were ordered and the patient complained of a little dizziness. After wearing his glasses for two weeks there was no relief and his physician then found that he was run-

ning into things on his right side and the field of vision showed that he had hemianopsia. He had neither vertigo nor vomiting. There was a moderate paresis of the left arm and leg with a tendency to drag the latter. The Wassermann, both blood and spinal fluid, was negative. He had exaggerated left knee jerks, with pseudoclonus, paresthesia and also anaesthetic areas on the anterior, outer side of the leg and foot.

The vision of the right eye 20 40 and Type 1. Pupil 4 mm. regular, reacting sluggishly to light. Media clear, disc distinctly outlined with a thin connective tissue ring, central excavation and cilio-retinal vessel. Fundus congested without hemorrhage, exudate or edema, although both the veins and arteries were fuller than normal. Left eye pupil 4 mm. regular, active, media clear, fundus with the exception of slightly full veins, negative. Field of vision showed a typical loss of the nasal side of the right and the temporal side of the left. (Fig. 30.)

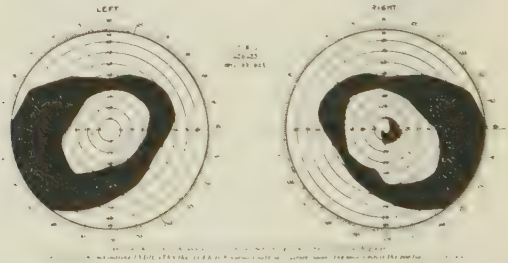


Fig. 30.—Visual fields in a case of cystic glioma of the right temperosphenoidal lobe.

Previous to his demise, which occurred shortly afterwards, he had persistent hiccough, but at no time was vomiting present. Sphincter control was lost. His mind remained clear to the last. The termination was by edema of the lungs.

On post-mortem examination a 5 x 6 x 4 cm. cystic glioma was found in the right temperosphenoidal lobe. (Plate XI, *A* and *B*.)

Tumor of the Corpus Callosum and Occipital Lobe. In contrast to the right-sided loss of field, is the next case, that of a 17-year-old boy, which shows a concentric contraction and left hemianopsia resulting from a lesion in the corpus callosum and occipital lobe. Three years previously, he had been given glasses by an optician, which however had not given relief and he had not worn them. The patient had attacks of temporary loss of vision, during which everything became black for a few seconds. Since July, 1923, he has had similar attacks of amblyopia at least three times a day. For about two months he has had occasional attacks of severe vomiting accompanied by intense frontal and vertex headache. He said he had some numbness of his right leg and some difficulty in doing his work, his hands seemed to be beyond his control. Although his gait was unsteady, there was no particular direction in which he tended to fall.

The vision of the right eye 20/30 Type 1. Pupil 7 mm. regular, reacting slowly to light, media clear, disc margins blurred, swelling of six diopters. Veins very large, no exudate or hemorrhage. Left eye the same in detail, with the exception that it was with greater difficulty that he read a few lines of Type 1. The field of vision showed a definite hemianopsia. The findings showed coarse nystagmoid jerks upon looking to the extreme right. Heel to knee and finger to nose tests poorly performed on both sides. Marked hypermetria is noticed in the finger to nose tests, particularly upon the left side. There is a coarse tremor of both hands and arms. There is rebound upon sudden release of passive resistance in the left arm. Romberg test is positive. The gait is unsteady and swaying but there is no marked deviation to one side or the other. In walking, the left arm swings in a wide semi-circle while the right is held rather close to the body. The deep tendon reflexes are increased in both extremities, upper and lower, and equally so. No pathologic reflexes are present. Superficial reflexes are present. The impression was that there was a midline

intracerebellar tumor. An exploratory operation showed no tumor, but the result of uncovering the cerebellum led to a most amazing degree of opisthotonos, which developed on his recovery from the anesthetic with seizures which resembled cerebellar seizures from which he died in a few hours.

The post-mortem examination revealed a huge glioma extending all through the corpus callosum and into the occipital lobe. (Fig. 31 and Plate X, *B*.)

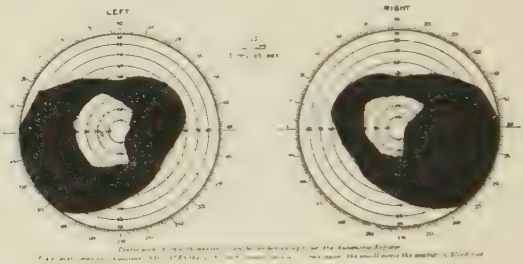


Fig. 31.—Lateral hemianopsia in lesion of corpus callosum and occipital lobe.

Chiasmal Neoplasm. Two cases of tumor in the region of the chiasm are cited to show the variation in type as evidenced by the general constitutional changes.

A man, 23 years old, was seen in May, 1923. For five years he had frontal headache which usually came on about twice a week and lasted for some time and was always worse in the morning. This he considered the result of influenza which he had five years previously.

Vision of the right eye 10/200 unimproved by glasses. Left eye 20/20, with corrected compound hyperopic astigmatism 20 15 and Type 1. Right eye: pupil 4.5 mm. regular, active, disc pale with clear outline. No blood vessel lesion. The left eye same fundus appearance. The right field showed a ring scotoma with marked contraction for form; in the left there was concentric form contraction. *X*-ray showed a marked

enlargement of the sella turcica with erosion of the posterior clinoids. (Fig. 32.)

It was found that the right frontal headache was less severe than formerly, but that he was having attacks of somnolence, was increasing in weight and had a voracious appetite. The right pupil did not react to light but did respond to consensual stimulation. He had a marked grayish-white atrophy of the right disc, the left was normal. The other cranial nerves were negative and the extremities aside from the generally hyperactive tendon jerks exhibited no functional disturbances. The diagnosis was hypophyseal tumor or Rathke pouch cyst. The similarity between this and the next proven case is so striking that there can be no question as to the diagnosis.

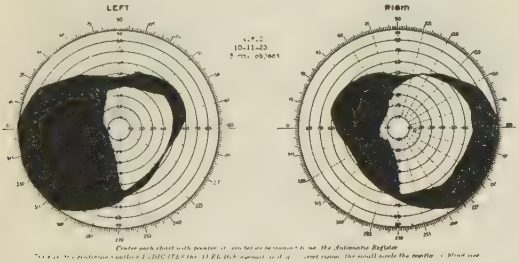


Fig. 32.—Visual fields in a case of neoplasm of the chiasm.

A 13-year-old girl was first seen in November, 1922. Two years before she had complained of pain in her right ear and right side of her neck, which was said to be a symptom of nervousness. Four weeks before her visit she had been successfully vaccinated and four days after the "take," it was noticed that her writing was not on a straight line. This was followed by severe headache which became so intense that she was taken from school and an eye physician seen. Her vision steadily failed. She frequently complained of feeling as though she were going to be sick to her stomach. These attacks were followed by trembling and were

ascribed to nervousness, particularly as they lasted only a short time, and as it was especially noted that they increased in severity as soon as she returned to school.

Vision of the right eye fingers at one foot. Pupil 5 mm. regular, active, media clear, disc distinctly outlined, definitely pale without loss of substance. The left eye was divergent without fixation and fingers were seen at one foot. Pupil 5 mm. regular, active, media clear, disc distinctly outlined, definitely pale without loss of substance. She had no spells of unconsciousness, no polyuria, polydipsia or appreciable change in weight. (Fig. 33.)

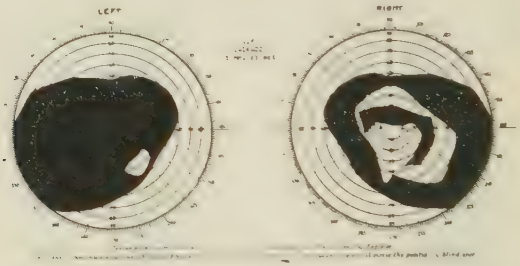


Fig. 33.—Visual fields in a case of large cystic tumor in hypophyseal region.

All of the findings except ocular were negative. She had no motor, sensory or co-ordination deficit in the extremities. The provisional diagnosis was tumor of the retrochiasmal region either hypophyseal or floor of third ventricle.

Her field of vision showed contraction for form, in the right, with a large ring scotoma. In the left an isolated area for form in the lower nasal side. X-ray examination disclosed an immense cauliflower-like tumor in the hypophyseal region. The following is a summary of the report, of findings:

The child has an unusually distinct and extensive suprasellar shadow caused by calcareous depositions in a Rathke's pouch cyst. Operation consisted of the osteo-

plastic procedure, evacuation of the cyst, and extirpation of large portions of calcareous pharyngeal duct tumor. Immediately beneath the dura there was a large cyst containing a slightly milky fluid with an abundance of cholesterin crystals; 70 c.c. of this fluid was collected. A soft tumor mass with gritty material lay between the right and left optic nerves in the region of the sella. A large mass of tumor and cyst wall was removed from the region of the carotid and middle cerebral arteries. After an extensive dissection the cavity was filled with salt solution, the flap replaced and the wound closed in layers without a drain.

Following operation she was very well with great improvement in vision. Three or four days later, however, she developed a left-sided hemiplegia and died.

The analysis of these two cases supports the view held by many that the seeming atrophy of optic nerve resulting from pressure is frequently a pallor and not a destruction of nerve fibers. This point has been discussed by several and is of considerable prognostic importance. It is certain that cases of this type tumor often show very marked improvement following operation, which could not result if the nerve fibers had been destroyed.

Acoustic Tumors. Acoustic tumors have probably been accurately diagnosed since 1777. The subject can best be summarized in the words of Cushing: "That the acoustic tumors, owing to the characteristic chronology of their symptoms may as a rule be sharply distinguished from all other tumors of the cerebellopontile angle." The case here detailed is typical.

A woman, 44 years of age, said she had been well until October, 1922, with the exception of an attack of influenza in 1918. During the winter of 1922 she had severe left frontal headaches which were worse in the afternoon. With this pain she had noises in her ears. These discomforts, however, lasted for only two months. She seemed perfectly well until October, 1923, when she

had difficulty in seeing at a distance, especially with the right eye. She also noticed that she could not hear well with her right ear and that the noises had returned on that side of her head. These symptoms were accompanied with intense epigastric pain referred to the back, extending into the occiput and along the spine, usually with nausea. The pain steadily increased in severity and at times she was given morphin. In November, 1923, she had an attack of weakness of her right arm and right leg with the drawing up of the right side of her mouth and twitching of the right facial muscles. Her vision had steadily decreased.

At that time, the right eye was blind, no light perception, pupil 4.5 mm. reacting consensually, media clear, the papilla extremely swollen 7 diopters with rounded margin, few blood vessels, no hemorrhage or exudate, a classical choked disc. Tension Schiotz instrument 15.

The left eye, pupil 4 mm. regular, active, media clear, disc swollen 7.5 diopters, with several flecks of exudate and faint striae of blood extravasation. Schiotz tension 13. Field showed an inferior nasal contraction. (Plate X, *C*.)

It is particularly noteworthy that she was absolutely deaf in her right ear, whereas her left ear showed no change in function. Both drum membranes were retracted, thin, without scar or vascularization. Because of the intense involvement of both papillas, the blind right eye and the loss of hearing in the right ear, a diagnosis of acoustic tumor was made. Through a T-shaped occipital incision an encapsulated tumor mass was uncovered, measuring about 3 x 4 x 2.5 c.m. in the region of the eighth nerve around the cerebellopontile angle. (Plate XI, *C*.)

It is interesting to record that the changes in the papilla were greater in the eye with the lower intraocular tension.

Chronic Serous Arachnoiditis. The last case shows

the difficulty of differentiating chronic serous arachnoiditis from a brain tumor.

A man, 46 years of age, was under observation for ten years. He came originally complaining of ocular and occipital pain. This was relieved by a compound hyperopic correction. Two years later he returned saying that he had had headache for a few weeks and that someone else had changed his glasses. He had no relief. At that time, he had an intense occipital and frontal headache, which started as soon as he raised his head from the pillow. He also had dizziness and a swinging gait. Vision of the right eye 20/100 with correction 20/20. Pupil 5 mm. regular, active to light and accommodation. Media clear, disc margin obscured by edema, veins distended with irregular masses of exudate and many superficial retinal hemorrhages. Papilla swollen 7 diopters. The left eye vision 20/100 improved to 20/40.

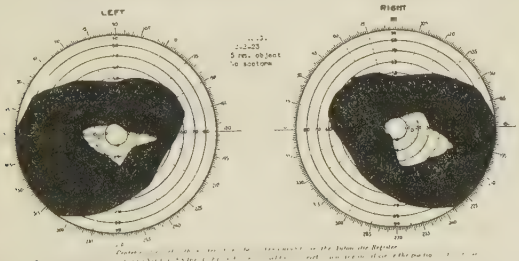


Fig. 34.—Contracted visual fields in serous arachnoiditis.

Pupil 4.5 mm. regular and active with practically the same fundus picture. The extra ocular muscles were in balance. The field of vision showed an enlarged blind spot. Twelve days later he was operated upon. A T-shaped incision was made in the occipital region, but no tumor was uncovered and the diagnosis of chronic serous arachnoiditis without tumor was made. When last seen he showed a definite pallor of both nerves, but correcting glass vision of 20/15 in the right and 20/20 in the left. There was an irregular contraction of the field in each eye. (Figs. 34, 35 and Plate X, *D*.)

By studying these reports we find that although both temporal tumors were very large, with a considerable loss of visual field, there was no marked fundus change in either. The chiasmal neoplasms showed slight pallor

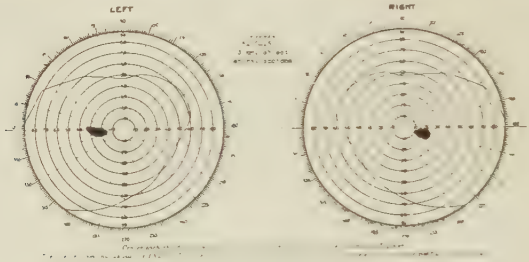


Fig. 35.—Enlarged blind spot in a case of serous arachnoiditis.

of the papilla with ring scotoma. The ophthalmoscopic inspection alone offered no help in the diagnosis of these four cases. However, in the other three cases the optic nerve and the surrounding retina was such as to make the diagnosis of intracranial lesion probable.

Summary. An extensive brain tumor may show no intra-ocular changes. A large tumor of the brain may cause no loss of the field of vision or may produce not only peripheral contraction but also scotoma. The variations in the field suggest the site of lesion. A small neoplasm in the posterior cranial cavity causes an early and intense optic nerve swelling. It is impossible to diagnose the nature of the growth or its location by fundus examination alone. Combining fundus, field, *x*-ray and neurological examinations frequently leads to the accurate localization of the growth. The earlier the diagnosis is made the letter.

Retrobulbar Optic Neuritis, With Special Reference to Bacillus Subtilis Infections. That the occurrence of retrobulbar optic neuritis is comparatively rare is generally conceded. That its recognition is doubtless sometimes overlooked, or at least delayed until either spon-

taneous recovery has taken place or irreparable damage has occurred, is well known and regrettable.

It is well known that uncomplicated cases of retrobulbar neuritis tend to clear up. This fact not alone causes some question to arise as to correct diagnosis, but causes reservation in accrediting the therapy used in a given case. There are, however, a goodly percentage of cases which will not be so fortunate and will go on to optic atrophy if something is not done and that at an early date. Most frequently it is the general practitioner who gets to see these cases first.

The patients complain of pain behind the eyes, in the depth of the orbit, especially upon movements of the eyes. The ophthalmoscope is of only little aid. In the beginning we see either nothing abnormal or a little hyperemia of the disk, dark and strongly filled veins, until at last we find the characteristic pallor of the temporal quadrant of the disk; but then, it is too late.

The best early index is given by an examination of the field. There may be annular scotoma or concentric contraction as symptoms, together with signs characteristic of the disease, central scotoma and enlargement of the blind spot.

J. S. Clark[6] reviews the recent literature of this condition and reports a case that came under his observation in which the etiology apparently was bacillus subtilis infection. Within 48 hours' time and upon waking in the morning the patient found herself blind in both eyes, with light perception only remaining.

The usual treatment was advised which seems to be common to all in dealing with cases of this sort. Pilocarpin sweats, mercury rubs into the temples, ethmoid drainage as well as spinal drainage was asked for. There was some aversion to the adoption of this treatment. *X*-ray of the head was negative. Blood serum was negative as to Wassermann. Colloidal gold test negative and negative as to tubercle bacilli. The spinal fluid was

(6) Ill. Med. Jour., November, 1924.

Wassermann negative, with a cell count of 100. Globulin negative. A gram positive bacillus present, which was identified as B. subtilis. The urine was negative. Repeated specimens of the spinal fluid were sent to two laboratories, and both reported the finding of B. subtilis. Care was taken against contamination of the specimen.

It was then learned that the patient had been handling a shipment of nursery stock which had been packed in straw and that this work preceded her first attack of rhinitis by but a few days. This gave a clue as to how she had received her bacillus subtilis infection.

The treatment given was that of pilocarpin hydrochlorate sweats every other day lasting for one hour's time. On alternate days and for three seances, spinal puncture in the lower lumbar region was done and 10 to 20 c.c. of spinal fluid withdrawn each time. The fluid was clear in appearance, and under no noticeable pressure. Mercury rubs were given in the temple area. Cyanid of mercury injections were given well back on the eye-ball and these were not repeated until reaction had subsided. Strychnin nitrate in gradually increasing dosage was administered hypodermically. Although intranasal operation had been suggested, none was performed. Two days after the institution of this vigorous treatment, the patient was able to distinguish large objects in her room and some improvement in light perception occurred in the left eye. The improvement in the vision continued with perfect return. With her correction she now has 20/20 in each eye.

The author has been able to find but one reported instance of bacillus subtilis infection which had to do in any way with the eye or the orbital structures.

The bacillus subtilis has been considered non-pathogenic, but the author's observation in this case would seem to coincide with other observers and tend to prove that such is not the case, especially as regards retrobulbar optic neuritis.

Optic Neuritis in Infantile Paralysis. The complication of optic neuritis in infantile paralysis may be more frequent than the number of cases reported would indicate, as ophthalmoscopic examination has probably been omitted in the majority of cases of the disease in acute or subacute stages. The visual disturbance is only transient and may be easily overlooked.

R. K. Ghormley[7] reports the case of a young man of 18 who showed an optic neuritis in both eyes, due, in all probability, to his general condition. In the routine examination of approximately 125 cases of infantile paralysis during the past twenty months, no other cases of optic neuritis were found by this observer. In the case here reported, the changes in the optic disk have receded slowly and there remains a considerable amount of blurring of the margins, although no atrophy has occurred and the patient has no subjective eye symptoms. The history of slight visual disturbance at the time of febrile attack, together with the findings in the eye grounds without any other causative factor, lead to the conclusion that the case is one of definite optic neuritis as a complication of infantile paralysis.

The Uveal Tract

Collateral Manifestations of Uveitis. Inflammation of the anterior uveal tract, because of its fairly uniform symptomatology and common occurrence, has too often been accepted as a clinical entity. Von der Heydt[8] emphasizes some of its collateral manifestations and describes a few of the newer observations regarding them.

Fluctuations in Tension. Fluctuations in intra-ocular tension are common in iridocyclitis. The lowering in tension is characterized by a definite coarse wrinkling of Descemet's membrane. This wrinkling, when once established, will be evident for a long period; in fact,

(7) Jour. Amer. Med. Ass'n., Feb. 21, 1925.
(8) Amer. Jour. Ophthal., May, 1925.

will continue even though the tension may again rise to normal or even above. It is certain that the presence of wrinkling denotes a previous hypotonia.

The increasing exudation, which may cause the rise in intra-ocular pressure, is probably rapid, but not sufficiently so to mechanically bring about a smoother appearance of Descemet's membrane. Hence the wrinkling—at least in part—will remain, in spite of the dew like infiltration of the corneal epithelium, the added definite evidence of hypertension.

Keratitis and Corneal Vascularization. If the inflammatory process is extreme in intensity and especially prolonged in duration, the clinical picture of iridocyclitis may be complicated by a definite keratitis, often including a deep vascularization of the cornea destined to be permanent. The eye will then forever bear the evidences of keratitis and uveitis. At times it may be impossible to decide which of the two had been the primary process. The history, that is, the age at the time of involvement, if this be available, as well as the evidence of monocular or binocular involvement, may be factors which may help to a decision.

Binocular involvement, that is a vascularization of both corneas, and the history of its occurrence in early life will indicate that the process had likely been primarily one of parenchymatous keratitis.

Monocular mild involvements of the cornea, characterized by vascularization in the late second, third or even fourth decade of life, are not parenchymatous keratitis due to acquired syphilis. In the author's experience they are delayed moderate evidences of inherited syphilis.

Neuroretinitis. Fuchs in 1918 first mentioned that in cases of chronic iridocyclitis the vision is often very much lower than what may be expected, in view of the comparatively slight obstruction in the optic media, discernible by the ophthalmoscope. The ophthalmologist often fails to take especial notice of fluctuations in the

visual acuity, because variations in the clouded media are so common in the symptomatology. It is, therefore, not surprising that a participation on the part of the retina and nervehead in the inflammatory process may be entirely overlooked.

Recent knowledge has disclosed that these complications are quite common in occurrence. Central scotomata have often been found present and are described by Meller in cases of iridocyclitis. Papillitis as a complication has been described by Fuchs, Elschnig and others. The joint response to therapy of the iridocyclitis and the retinal complications in these cases has proven their etiologic relationship and interdependence.

Recently Zeemann has described cases of iridocyclitis, some of them tubercular, with coexisting retinal and papillary lesions. He has sectioned four cases where the anterior uveitis was of traumatic origin. The latter have proven microscopically that the toxins first involved the retina at the ora serrata; and then passed along the smaller to the larger vessels toward the nervehead, where the secondary lesion was found. These lesions consisted of collateral edema, that is inflammatory swelling at the nervehead. In certain clinically observed cases of nervehead lesions coexisting with anterior uveitis, the manifestations consisted of central as well as sector formed scotomata. It is also accepted by pathologists that the toxins of iridocyclitis may at times pass along the lymph spaces in the vitreous. The direct retinal involvement, from the ora serrata backward, has also been recently confirmed by Meller. He has proven that direct infection at the ora serrata has caused a periphlebitis of the retina; not alone in ordinary iridocyclitis, but also in cases of sympathetic ophthalmia.

Recently the author has had occasion to witness this participation on the part of the retina and nervehead in several cases of iridocyclitis, thus proving that if recognized the complication may be often found. A case of iridocyclitis was brought in consultation, in which

comparatively clear media revealed a very severe inflammatory edema at the nervehead. This was the cause of almost blindness in this eye.

Two other cases of uveitis with comparatively clear media showed an edema at the nervehead, beautifully visible stereoscopically with the Gullstrand large binocular ophthalmoscope.

It is the province of this paper to suggest a more careful examination of the retina in all cases of uveitis. If found sufficiently transparent the fundus should be subjected to careful scrutiny. In the presence of an unaccountable lowering of the visual acuity, or even without it, one will be surprised how often a nervehead of retinal involvement may be actually discovered. In cases of very low visual acuity, with negative ophthalmoscopic findings, a perimetric examination may disclose a minor involvement.

Leukocytosis. Leukocytes in the aqueous are now conceded to be the earliest visible evidence of uveal involvement. These cell elements, when not present to excess in an otherwise unaltered aqueous, demonstrate the normal circulation of the aqueous humor within the anterior chamber.

In cases of endogenous iridocyclitis, the incipience is characterized by a fairly rapid circulation and a comparatively clear cornea. As the process advances rigidity develops in proportion to the increasing viscosity of the aqueous, due to an addition of exudate derived from the blood and lymph. These changes in movement give evidence of the progression or retrogression of the iridocyclitic process. Vogt has observed leukocytes in active ameboid movement on the posterior cornea. The author has repeatedly seen individual leukocytes make an instantaneous disappearance from attachment on the posterior corneal surface, evidently again being carried into the activity of the aqueous media.

It is an error to attempt to overisolate choroiditis, as being a clinical entity in itself, characterized as the

textbooks say, by the absence of redness or pain. All cases of active or recently active choroiditis—no matter how mild—show a definite leukocytosis, with leukocytes deposited in the cornea, anterior lens capsule and more or less actively in motion with the aqueous. These leukocytes definitely prove the presence of collateral inflammatory reaction on the part of the ciliary body, though the choroiditis may otherwise be very mild in its manifestations. That choroiditis may be so mildly chronic as to exclude the possibility of direct opthalmoscopic diagnosis, is proven by the large number of evidently old chronic cases where slight complicated cataract is the only discernible evidence of pathology.

By the absence of leukocytosis in choroiditis a quiescence may be diagnosed, while the presence of leukocytes definitely speaks for present, or recent inflammation. This is of immense importance—not alone in cases of recent primary choroidal involvement, but especially so where old pigmented lesions are present and a recurrence is being suspected.

Because of the absence of the danger of iris synechiae, local medication is often deemed unnecessary in choroiditis. The so easily differentiated inflammatory activity evidenced by the leukocytosis surely constitutes a positive indication for the use of a cycloplegic.

Ocular Leprosy. According to D. J. Wood,[8] the eyesight of persons who have contracted leprosy is nearly always affected, if they live long enough. The great cause of loss of sight, according to this observer, is iridocyclitis. The condition begins very insidiously, and is well developed before acute attacks are felt, and progress is invariable, going on to occlusion of the pupil, opacity of the cornea, lens and vitreous, with shrinking of the eyeball. Lepromata, if present are very small, but can be seen as yellow points lying on the iris in every case of irido-cyclitis. They are pathognomonic, no other eye condition resembling them in the least. Any ef-

(8) British Jour. Opthal., January, 1925.

ficient loupe will show them. The iris texture is rotten so that iridectomy fails. Atrophy is always a component of the disease, and however much the iris is adherent, glaucoma never results.

The author reports the case of a 21-year-old Jew who contracted the disease when about 11. With the binocular microscope and slit-lamp one can see profound changes such as are imperfectly seen in the illustration (Plate XII), or more complete destruction of the tissue, so that no stroma, sphincter or uveal tissue can be recognized in the neighborhood of the pupil, there being merely an inflammatory membrane which ends in a shrunken opaque lens with hardly a visible boundary.

The iris and ciliary muscles are early affected in leprosy. The pupil is sluggish or inactive, and there is a premature presbyopia even where distant vision keeps good. The pupil may be distorted either by adhesions or, as in this case, by cicatricial changes. The pupil here is immobile and the edge is drawn towards the periphery by contraction in the iris substance. The uveal edge is everted in this region. There is only one actual adhesion of the pupillary border visible, very different from what happens in ordinary iritis. On the surface of the iris may be seen rounded nodules raised above the surface so as to cast definite shadows. They are pink with a dense centre. Smaller than these, and not visible with a loupe, are similar nodules going down in size to particles hardly visible separately. Anywhere in the iris one can see darker depressed spots where one may presume leprotic nodules have been absorbed. The stroma pattern of the iris is represented by white lines in a porous crumbly-looking tissue. There are no crypts. No blood vessels are visible, but in other cases, where atrophy is greater, the radial vessels of the iris may become exposed. The aqueous is full of circulating cells showing that inflammatory changes are in progress. True precipitates on the back of the cornea do not occur in leprosy.

PLATE XII.

Early case of leprotic iritis. Note the pupil drawn towards the periphery, everted uveal edge, rounded nodules, and fold filled with deposits.—Wood, page 155.

Until the present case the author had never seen ocular leprosy where iritis had occurred, and where there was an episcleral lepromatous thickening, which did not continue to get worse continuously and at an appreciable rate. Under the administration of subconjunctival injections of bicyanid of mercury to which was added purified ox-gall, improvement began almost immediately. All the thickening around the cornea has disappeared, and the eye appears quite normal except for the distorted pupil. That the improvement is not due merely to a general improvement is suggested by the fact that, whereas the patient was supposed to be a nearly arrested case, he has had, during the treatment, a severe general relapse affecting arms and legs, and the other eye was removed because of pain.

The Orbit

Roentgenotherapy in Sarcoma of the Orbit. There are very few cases of sarcoma of the orbit reported in literature as having been treated by the roentgen rays. The Schmieden surgical clinic in Frankfort-on-the-Main has, however, for several years given up all operations on sarcoma, and is treating them by irradiation

G. E. Pfahler[9] gives a brief summary of 26 cases which he has treated in the past twenty years.

In nine cases of recurrent sarcoma of the orbit, six of the patients have died. All but one showed a definite improvement, lasting from two to fifteen months. One patient with osteosarcoma is apparently free from disease at the end of three and one-half years. One patient with sarcoma of the eyelid was well nine years, and is probably still well. One patient with melanotic sarcoma of the conjunctiva improved for a year, but died of metastasis.

The poor results in the recurrent cases, as compared

(9) Jour. Amer. Med. Ass'n., Jan. 10, 1925.

with the good results in the primary cases, would argue against operation and in favor of early and thorough, but skilful, irradiation of the primary tumor. This is what one would expect when it is realized that cutting into sarcoma favors implantation and dissemination. Most of these patients died of cerebral involvement. If, for any reason, a patient is operated on, there should be prompt postoperative roentgen ray treatment, or probably, better, implantation of a radium capsule in the orbit following evisceration.

Fig. 36.—Sarcoma. *A*, wound of exploratory excision and protruding eyeball; *B*, after four weeks of daily treatments with fractional doses, showing some dermatitis and eyebrow preserved; *C*, after thirty-four fractional treatments: eyebrow preserved; eyelashes gone; *D*, after forty treatments within three months: practically well.

General Effects on the Normal Tissues. In all of these primary cases there has been no ill effect on the lids, conjunctiva or cornea, and all have been able to preserve the eyelashes and eyebrows. The preservation of

the eyelids and eyebrows requires the greatest care in outlining the fields and directing the rays during cross-firing. (Figs. 36 to 39 incl.)

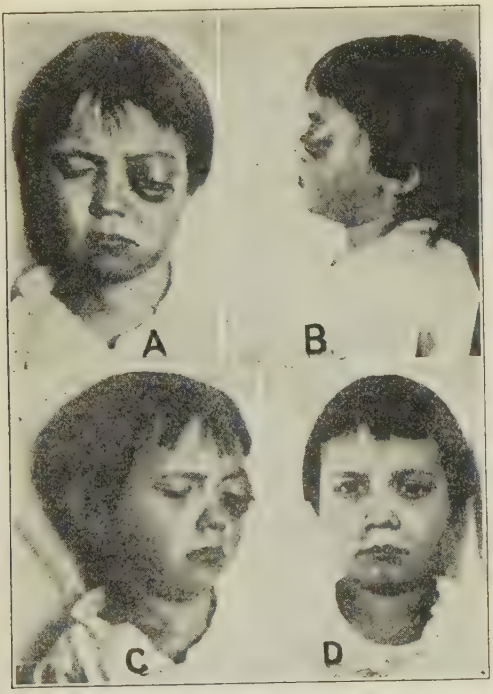


Fig. 37.—Sarcoma. *A, B, C,* retrobulbar sarcoma developing during two years before treatment; *D,* patient well, Oct. 13, 1917; the patient has had no treatment since, and has remained well; eyebrows and eyelashes preserved; cataract has developed.

Technic. The technic during these twenty years has passed through evolutionary changes. The first case was treated by means of small fractional doses, with unfiltered rays, carried just to the point of producing an erythema. In spite of this, all visible and palpable disease disappeared for about a year. It was a recurrent case, and the patient died with metastasis to the brain.

No matter what technic is used, the roentgenologist must determine or be told of the extent of the disease. He must then deliver about 100 per cent. of an erythema

Fig. 38.—Retrobulbar Sarcoma. *A*, protrusion of eyeball, Oct. 2, 1918; *B*, disappearance of tumor, with normal appearance of both eyes, March 13, 1919; eyelashes and eyebrows preserved; *C*, protrusion of eyeball at beginning of treatment; *D*, complete recovery.

dose into all the tumor tissue, and must not damage the normal tissues. This requires a knowledge of irradia-

tion values and of the principles governing distribution.

Conclusions. 1. Irradiation has shown improvement, but has been an ultimate failure in nearly all recurrent cases of sarcoma of the orbit.

2. Roentgenotherapy has been successful in the majority of primary sarcomas of the orbit.

3. Roentgenotherapy should be the method of choice in all primary sarcomas of the orbit.

Fig. 39.—Retrobulbar Sarcoma. *A*, *B*, marked projection of eyeball, with no vision, at beginning of treatment; *C*, Oct. 30, 1922: complete disappearance of tumor tissue, with preservation of the eyebrows and most of the eyelashes; vision defective in right eye; no damage to skin.

4. When used early, roentgenotherapy has shown prompt results, and has done no harm to normal tissues.

5. A biopsy for diagnostic purposes does not seem justified.

6. Skill and general medical knowledge is of as much importance in radiotherapy as in surgery.

The Visual Field

Demonstration of a Visual Field Apparatus. The desire to chart the full visual fields of an unrestricted eye while stabilized by binocular vision has led Theodore C. Lyster[1] to try out many devices. In applying

(1) Northwest Med., January, 1925.

this idea for use with a certain tangent screen he has attempted to make the screen practicable for routine work. A small conical tube was devised which can be adjusted readily in front of either eye by sliding this tube on a horizontal rod above the forehead. This confines the vision of this eye to a circular area about 6° in diameter. The tube is so constructed that a prism from the ordinary trial lens case may be placed within and rotated to obtain binocular vision. The eye looking through this tube merely acts as a stabilizing eye, leaving the other eye free of all restrictions for determining its full visual field.

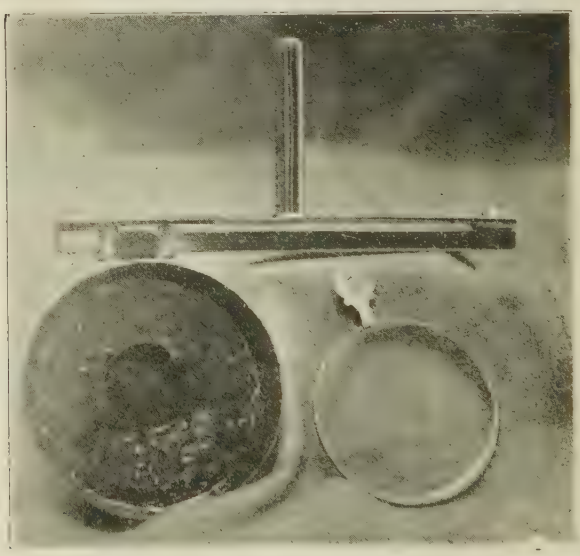


Fig. 40. Stabilizing test for binocular fixation, looking forward.

When the face is in the rest and the chin-rest is adjusted so that the eyes are on the line with the two fixation points on the curtain, the eye is 55 cm. distant.

With both eyes open, one of them looking through the conical tube, a 12° prism is placed in the tube, base out, and rotated so that the fixation points are seen on line.

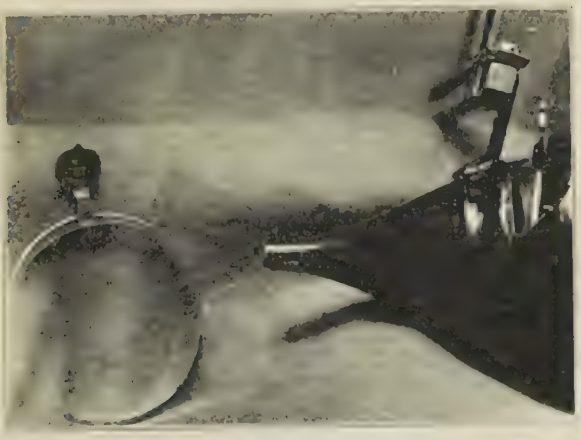


Fig. 41.—Side view of tube for binocular fixation with prism.

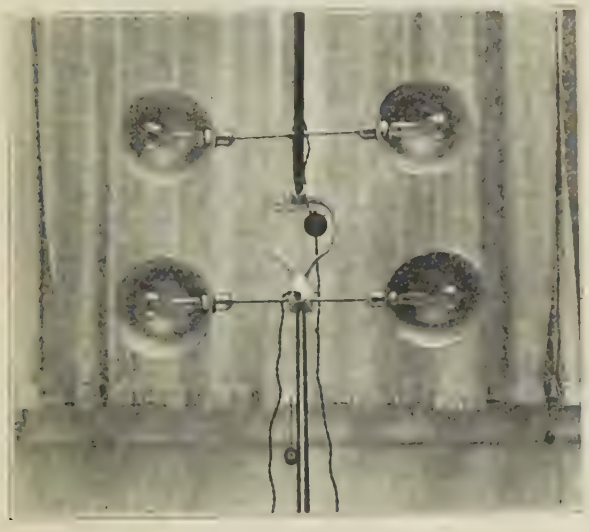


Fig. 42.—Front view of Lyster screen.

If two points only are seen, then there is fusion; if three points are seen, fusion is not present. It may be necessary to increase the strength of the prism to correct a muscular imbalance. In the great majority of cases fusion is readily obtained with a 12° prism, base out. The eye under examination is now held fixed by its desire to maintain fusion. (Figs. 40 and 41.)

The nasal field as well as the temporal field of this unrestricted eye may be determined and charted on the curtain, upon the surface of which has been placed a scale in India ink. The findings may now be photographed and the films filed as a permanent record. The

Fig. 43.—Angle view of Lyster screen.

circular area of 6° seen by the stabilizing eye should be charted with the stabilizing eye occluded. Electric illumination is preferred because constant. By using two 250-watt daylight bulbs in two separate reflectors, the illumination is satisfactory, for colors as well as white.

The following features of this visual field apparatus seem worthy of noting:

1. A light take-down portable tubular steel frame.
2. Two gray cotton translucent curtains 180x120 cm., right and left respectively, easily attached and detached from the frame.
3. Two fusion points 5 cm. on each side, horizontally, of the center of the curtain.
4. Two 250-watt electric daylight bulbs with reflectors so placed that uniform distribution of illumination is obtained.

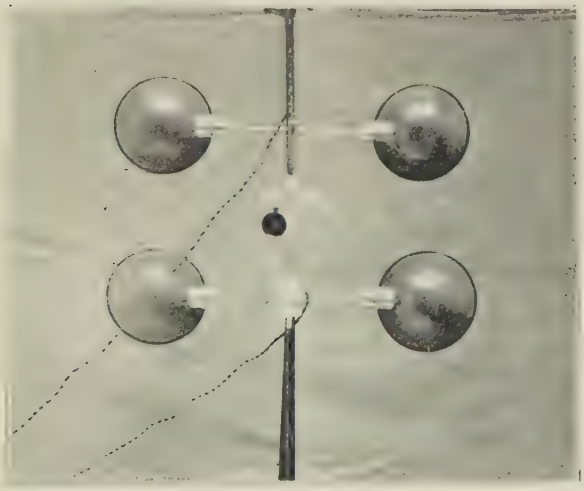


Fig. 44.—Screen without curtain, from the rear.

5. Long double-ended and double-faced disc-tipped carrier rods are used, white, red, green and blue discs. (Any size discs may be used, but 5 mm. and 10 mm. diameters are most satisfactory for routine work.)
6. Charting is done in chalk, preferably on the reverse surface of the curtain, invisible to the patient.

The shadow of the tip of the rod is clearly seen through the translucent curtain. An India ink scale is stamped on the reverse surface, which clearly shows when photographed.

7. The curtain after use should be rinsed in cold water and replaced upon the frame to dry.

8. The negative or positive may be used in a stereopticon.

9. A degree on the tangent curtain is sufficiently large for determining minute changes in scotomata and peripheral limitations. The blind spot is 6° x 7°.

10. The charts when photographed furnish a convenient, accurate and permanent record.

11. The full visual field record is on a single chart.

The disadvantages are those incident to a tangent screen. (Figs. 42, 43 and 44.)

The Visual Field in Toxic Uveitis. The ocular syndrome here described by H. H. Martin[2] is a very common one, though it is not always recognized until after serious and permanent pathologic changes have been established.

The clinical symptoms in the early stage are quite mild in character, the patient complaining only of occasional floating bodies with some confusion of vision and he is often dismissed with the assurance that the floating bodies are physiological and that a laxative is the only treatment indicated. A more careful examination, however, will often disclose a definite pathology consisting of a slight cloudiness of the anterior segment of the vitreous with usually one tadpole shaped floating body surrounded by numerous granular and occasionally some string-like bodies, visible to the observer only with a plus ten to plus twenty lens. The fundus appears normal in every respect and in the early stages the exudates are definitely limited to the anterior segment of the vitreous. The interesting feature in this group of

(2) Southern Med. Jour., June, 1925.

symptoms is the contraction of the visual field for white, without any alteration in the color fields and without visible or demonstrable pathology of the optic nerve, and in at least one case, the contraction of the visual

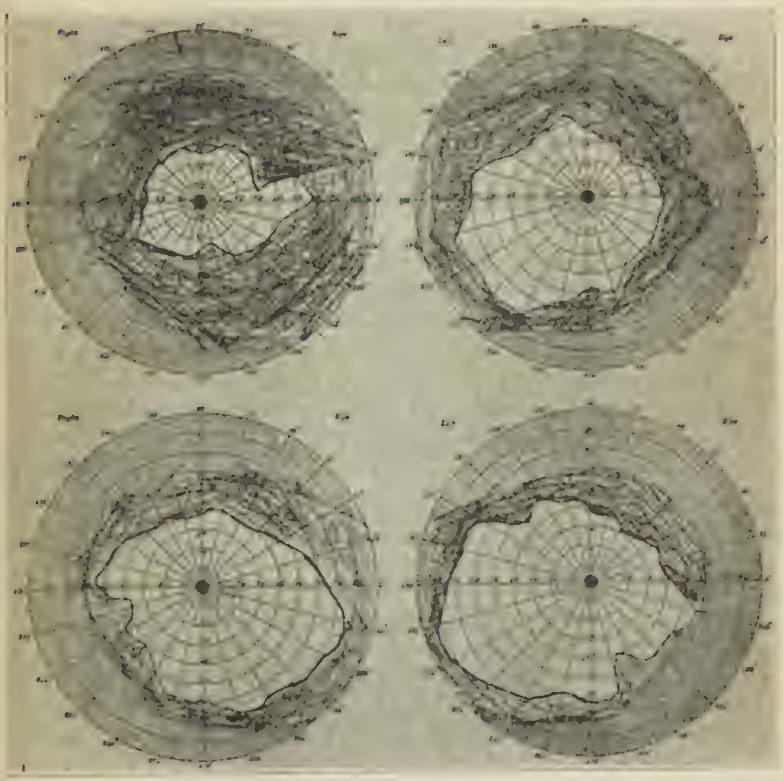


Fig. 45.—Top left and top right: Case No. 1, first examination. Bottom left and right: Case No. 1. One week after extraction of infected tooth.

field was present to a marked degree in both eyes while the vitreous opacities could be demonstrated in the right eye only, the left eye showing no pathologic changes. The symptoms all disappeared simultaneously and

promptly upon the removal of an infected tooth. That this syndrome should be classed as a definite clinical and pathologic entity seems quite evident, and equally definite and convincing is its direct relation to a septic focus elsewhere in the body.

The author has had under observation and treatment since 1919, sixteen typical cases; fourteen in which only one eye was affected and two in which the condition was bilateral. In ten of the fourteen unilateral cases the field was not taken in the unaffected eye.

All were adults, eleven male, seven female. Two of the cases were bilateral, pathologically and clinically and in all cases where the field was taken in both eyes, there was more or less concentric contraction in the unaffected eye. Two relapsed but promptly recovered when the cause was located and removed. Recovery was complete in all cases except one, who did not return after the first examination. The principal etiologic factor in all was a septic focus elsewhere in the body occurring about equally frequently in teeth and tonsils. Just how many of these cases would have gone on to a general uveitis can only be conjectured. It is fair to assume, however, that all of them would. The contraction of the visual field, so constant a factor in the clinical picture, should lead to the uncovering of more of these cases, with a curtailment in the number of cases of graver pathology in the uveal tract. (Fig. 45.)

Glaucoma

Early Diagnosis of Glaucoma. Errors in diagnosis of glaucoma are much more common than they should be, therefore the importance of recognizing this insidious disease at a very early date is to be emphasized, in the hope that the disastrous consequences of this dreaded disease can be prevented by an intelligent study and a proper interpretation of its symptoms. The significance

of many of the early symptoms of this condition, which might lead to a mistake in the diagnosis, is pointed out by Weih.[3]

Simple glaucoma is so insidious in its onset and so devoid of striking symptoms that it often exists for some time without attracting serious attention, while Fuchs states that although the symptomology of congestive glaucoma is so well recognized it is still very often diagnosed too late. There is no disease of the eye in which it is more important to take a careful account of the general physical condition and health of the patient than in glaucoma. Probably the more we learn about ocular disease the more widely will we perceive its relation to general conditions. La Grange in his latest book says that glaucoma is generally not a local disease but an ocular condition occurring in an already diseased organism.

It is a well known fact that acute glaucoma can exist unrecognized for some time because symptoms which generally accompany it, headache, vomiting and malaise, obscure the eye trouble. Throughout the prodromal period there are recurrent attacks of intra-ocular tension often accompanied by unilateral headaches. These are frequently treated by the family physician and, as the significance of such recurrent headaches of this character has not been definitely brought to his attention, these headaches receive no ophthalmological consideration. The headaches, which make us suspicious of glaucoma, are those which come in the morning and last for a short time; or headaches in people past middle life when all refractive errors have been corrected; or headaches in elderly patients associated with vomiting. In acute cases the vomiting stops in 24 to 48 hours, but nausea may last for weeks and is often the only warning sign of a fresh rise in intra-ocular pressure. The prodromal symptoms are apt to make their first appearance during a period of mental or body fatigue

(3) Jour. Iowa State Med. Soc., May, 1925.

and to pass away in a few hours. This is one of the reasons why so little attention is paid to them. When a patient who is suffering from any disease or injury complains of pain or an increase in pain we should test the tension at once. Pain varies enormously in different cases. The early short attacks of subacute glaucoma may have mild feelings of discomfort or of ocular pressure occurring periodically and lasting but a short time. The acute disease is usually marked by severe pain. The oculist may make the mistake of thinking the cause of the pain is in the nose, ears or teeth because the pain is not always in the eyes. Sleep will greatly lessen or stop this pain. Coal tar products have no effect on the pain but miotics act like a charm. When an elderly patient suffers from facial neuralgia, especially if it is associated with loss of sleep and appetite, it is well to examine the eyes. Lacrimation with normal lacrimal apparatus, not connected with other causative factors is sometimes an early symptom.

Sensations of light may occur in the early stages of congestive glaucoma, especially if the patient is tired. This symptom also occurs in any condition where the retina is irritated, similar phenomena of central origin are met with in neurasthenic patients suffering with errors of refraction and nervous troubles.

Circumcorneal congestion is a constant factor in acute and subacute glaucoma while enlargement of the episcleral veins, especially of those which perforate the sclera, is the rule in chronic glaucoma.

The frequency of mists and halos, as noticed by the patient, gives us valuable evidence as to the recurrence of congestive attacks. In the earliest stages they come and go and are due to cloudiness of the cornea. Halos are a very delicate symptom of a rise intra-ocular pressure. When a diagnosis has been made mists and halos are a much appreciated bit of evidence of the onset, duration and frequency of the acute attacks. In describing mists some patients speak of a cloudiness of

sight, some of seeing through a smoke, while others state that there is a fog in the atmosphere. Some patients complain that these mists are very bad in the early morning and gradually pass away as the day goes on, others have them later in the day and the attacks synchronize with periods of fatigue, but food, rest or diversion relieve them. When mists are present halos around lights can also be seen. At certain times, under favorable conditions, these halos are so faint they have to be carefully looked for, while at other times every tiny flame has its ring of light. It is very important to distinguish between true and false halos. The real glaucoma halo is much brighter than a false one, the patient can easily see three or more colors, a central blue, a middle yellow and an outer red. Using a small source of light a distance of ten feet in a dark room the glaucomatous halo should measure from twelve to twenty-four inches in diameter. They will vary in size in different patients and in the same patient at different times. Physiological halos are constant in size, measuring about fourteen inches in diameter. Patients who have a glaucomatous family history and who have a low corneal diameter should come back periodically for observation and should report at once any suspicious symptom of the disease. Anesthesia of the cornea is usually attributed to compression of the nerve fibers going to the epithelium, by the fluid in the lymph spaces or to a compression of the long ciliary nerve.

A shallow anterior chamber occurs as a result of the swelling of the vitreous or congestion of the ciliary body or both, or it may be due to a closing of the angle of the anterior chamber due to adhesions. In the earliest stages the anterior chamber is shallow only during the congestive attacks but in the later stages it may become permanently shallow. It is often of great importance to know how far forward the adhesions extend. Salzman has given us a method of examining the angle of the anterior chamber from the side by direct or indirect

ophthalmoscopy with or without the use of the contact glass. The angle of a shallow anterior chamber can only be examined with the use of a contact glass. A disposition to glaucoma is often indicated from the condition of the angle of the anterior chamber and much valuable information may be obtained as to the depth of the chamber and the presence of synechia. Often in early glaucoma one can find sepia brown or black pigment spots of pigment epithelium origin in the Schlemm's canal region. During acute congestive attacks the contents of the anterior chamber are often turbid, the result of inflammation of the ciliary body and iris; this leads to deposits on the posterior surface of the cornea. The finding of these deposits is important for the recognition of the cause of glaucoma and is the main indication for the use of mydriatic drugs.

In the earliest stages there is little change in the pupil but later dilation of the pupil is almost constant in the congestive attacks. This dilation is associated with a sluggish response of the pupil to light and accommodation and increased with the duration of glaucoma. Later this dilation becomes oval with its long axis vertical. Knapp states that adrenalin causes dilation of the pupil in glaucoma but not in a normal eye. During the acute congestive attacks the iris may become extremely congested and altered in color. Later this color fades to a gray with atrophic patches on the surface of the iris. The characteristic black edge of the pupil, due to eversion of the uveal pigment at the pupillary margin, is only seen in the late state. In simple glaucoma we get a dilation of the pupil without iris changes. The pupil will respond to miotic or mydriatic drugs even though the light reflex is feeble or absent.

The earliest sign of glaucoma associated with the ciliary body is a weakness of accommodation. Patients complain of continually changing their reading glasses. They may have normal vision but they do not care to read. This accommodation weakness is most marked in

the congestive attacks but does not completely pass away during the intervals. This results in the patient's presbyopia increasing out of proportion to his age. Pain accompanying a series of presbyopic changes is an important symptom. The forward movement of the iris and lens leads to an increase in the refractive powers of the eye, in other words, the patient becomes more myopic. These changes are not enough to compensate for the marked increase in presbyopia. A cataractous lens secondary to glaucoma is characterized by a lack of details; it looks more smoky and greenish than the ordinary form of cataract. Where the glaucoma is secondary to cataract the lens has the characteristic intumescent appearance and many times there is an uncomplicated cataract in the other eye. In many cases we may have cataract and glaucoma combined without any relation to one another.

Perimetric examination, when conducted in a reliable manner, furnishes the most delicate and reliable indication of the presence of glaucoma, the progress of the disease and the value of any method of treatment.

Examination of the fields shows that the nasal portion of the fields is affected before the temporal and becomes more affected as time goes on. The central field is present until a late stage and as the disease progresses the field shrinks towards the center. Central defects consist of an enlargement of the blind spot of Mariotte, which is a very early defect, and of a sickle shaped scotoma which are connected with the blind spot and radiate above and below it. This scotoma is supposed to represent a lesion of the nerve fibers at the edge of the disc. Paracentral scotomas, if followed for some time, can be traced until they join with the enlarged blind spot.

The light sense is affected in glaucoma. Patients have difficulties when they pass from light into darkness. Bright days dazzle them and dark days interfere with their vision. The various authors disagree on what these light changes are. An examination of the light sense

ought to give us valuable data. Diminution in visual acuity is a frequent if not a constant sign of glaucoma.

Every oculist should use a tonometer in his ordinary examinations because in the majority of cases it tells us if the intra-ocular pressure is normal or abnormal and if the pressure in the two eyes is different. Variation in pressure is an excellent means for determining the progress of the disease. Increased intra-ocular pressure is a symptom and no symptom is pathognomonic. Jackson states that simple glaucoma may exist without increased intra-ocular tension and on the other hand a very striking increase in intra-ocular tension may be found in connection with a uveitis and this tension drop in a few days to normal without any loss in vision or signs of glaucoma. According to Thibert, lying down has no effect upon the tension of a normal eye, but it increases the tension of a glaucomatous eye and also of an eye predisposed to glaucoma. Homatropin produces no change in tension in normal eyes but it does in glaucomatous disposed eyes.

[If a patient presents but a single premonitory symptom of a pre-glaucomatous condition, it would be well to take the tonometric pressure at fixed intervals several times a day for a number of days, under conditions as nearly as possible the same each day.—Ed.]

People sixty years or older whose vision cannot be improved beyond 20/30, although there is no apparent reason to be found as all the eye structures are normal, have often been demonstrated by later findings to be incipient cases of glaucoma.

Dimmer believes that bending of the blood-vessels on the upper, lower or nasal border of the disc is evidence of early glaucoma; often these vessels appear to be drawn towards the nasal side. The next thing we notice is the blood-vessels on the disc make a strong bend outward and the smaller vessels, which ordinarily take a

straight course, make a similar bend. In questionable cases it is of great diagnostic importance to compare these findings with the other eye.

Pallor of the disc is a very early and suggestive sign in some cases and is due to a constriction of the vascular supply, the result of the increased pressure. Early cases often show a slight depression of the disc, not enough to be measured by the ophthalmoscope, but enough to be detected. The typical cupping of the disc is a feature of established glaucoma and is often absent in the early cases. Posey states that a tendency of the scleral ring to become visible all around the disc and its disposition to broaden especially on the temporal side is one of the first things to excite one's suspicion.

Pulsation in the retinal veins is generally believed to be a sign of glaucoma, especially if mydriatics increase the amount of pulsation or cause the appearance of a pulsation that was not present before the use of the drug. We know very little about venous pulsation in normal eyes, therefore it is not safe to say much about it in diseased eyes. There is no pulsation in retinal arteries of normal eyes because the diastolic blood-pressure is higher than intra-ocular tension. If the intra-ocular tension equals the diastolic blood-pressure, then the retinal arteries will empty in diastole and fill in systole. During the acute attacks of glaucoma the choroid is congested; this causes a venous congestion of the eyeball and a distension of the vasa vorticosa.

In order to diagnose glaucoma in its earliest stages, the patient should be thoroughly examined. This is such a long task that much time must be given to it. A diagnosis should never be made on a single symptom, but every factor in the case, which can guide the judgment, should be taken into consideration and no diagnosis should be made until every modern method at our disposal has been used.

The Newer Operations for Glaucoma. Robert H. Buck[4] comments upon the steps in the newer operative procedures for glaucoma, as follows:

1. The conjunctival covering.

The ideal subconjunctival filtration area is a broad flat cushion. Normally this space can be infiltrated readily. When, however, adhesions form between sclera and conjunctiva this process is seriously interfered with. In view of this fact it will be seen that any extensive separation would tend to limit the distribution of the aqueous into the subconjunctival space by the formation of scar tissue, and thus produce a vesicle.

Seidel has shown, by staining, that small openings appear on the surface of these blebs, indicating a direct communication with the interior of the eye, with the resultant danger of infection. Elschnig, however, attributes the relative frequency of late infection following trephining, not to the thinness of the conjunctival covering, but to the absence of an adequate vascular supply in the trophically injured conjunctiva. It would seem then that a narrow subconjunctival tunnel would be a safer and more effectual procedure in this step of the operation.

2. The sclerectomy.

Since the available space from which a piece of sclera can be excised without interference with the ciliary body is limited to about 1 mm., Elliot found it necessary to carry his trephine hole up into the cornea, as an opening smaller than 2 mm. too frequently became plugged, and thus defeated the object of the operation. Lagrange and Holth, in order to secure adequate drainage make the opening 1 by 3 mm.; but this procedure materially weakens the ocular wall as compared to the round trephine hole.

It is just here that iris inclusion operations find their greatest advantage, for in these cases the formation of a fistulous tract does not depend upon the removal of

(4) Amer. Jour. Ophth., March, 1925.

scleral tissue, and that such a tract is produced has been sufficiently attested by fairly extensive reports of successful clinical results, but more especially by the histologic findings in eyes enucleated some time after the operation for some other cause.

3. The iridectomy.

The advantages of complete iridectomy are: First that in those cases in which no peripheral synechiae are present, or in which they can be freed by Török's procedure, it makes a free opening to the spaces of Fontana, and second it severs the sphincter and thus removes the only objection to the use of atropin.

The peripheral iridectomy on the other hand is preferable in the cases in which only external drainage avails. It furnishes free passage for the aqueous, leaves the iris sphincter intact for the further exhibition of miotics, and avoids the dazzling and blurring of vision so common after complete iridectomy.

It is here that we find the greatest weakness of iridotasis. If the contention of Borthen is correct, this traction on the iris must result in drawing up of the pupil which with the coloboma diminishes visual acuity and causes dazzling.

The contention that the incarceration of the iris in a scleral wound is fraught with grave danger would seem to be a chimera, as evidenced by the increasing volume of favorable reports of iridotasis.

Tonometry

Tonometry is a question of relativity. Tonometry is not new. Even before the time of von Graefe, tonometers were on the market and there have been at least seventeen different tonometers advocated by different men. They have all been of one or two types, the application or depression tonometer. The first type has gone into the discard. The second or depression tonometer has

centered itself upon one basic principle, *viz.:* that advanced by Schiotz, in which the instrument itself of definite weight is put upon the eye and a further depression of the cornea is induced by a stilette upon which a weight of known quantity rests. The amount of depression of this secondary weight is then read off on a scale and translated empirically into millimeters of mercury. The tonometric pressure of the eye, as we understand it, and as shown by Harry S. Gradle,[5] is not the absolute pressure of the eye, in any sense of the word. Nor does it bear any definite relationship to the manometric pressure. The intra-ocular pressure may be measured by means of the manometer. This is fairly accurate, although slight variations may occur. However, the tonometric pressure measured with the tonometer does not bear a constant relationship to the manometric pressure, because there are so many qualifying factors that are introduced. The rigidity of the cornea is dependent not only upon the adherent tissue of the cornea itself, but also upon the variations in thickness of the cornea. The rigidity of the sclera plays a great role. The relationship of the depth of the anterior chamber to the depth of the lens plays a role. The patency of the anterior chamber angle plays a role. The relationship of the intra-ocular pressure to the systemic blood pressure, and in turn the relationship varies day by day and hour by hour. These things all influence the tonometric pressure. Therefore, we can not say that the intra-ocular pressure as read on the tonometer is the pressure of the eye. It is an empirical figure, which bears a varying relationship to the manometric pressure of varying eyes.

The absolute measure of intra-ocular pressure as made with the tonometer is worth nothing. It does not make a particle of difference what the tonometric pressure is as recorded in one measurement because we do not know what are the upper or lower limits of normal tonometric

(5) Ill. Med. Jour., April, 1925.

pressure for the one eye. We do not know whether the difference between the manometric and the tonometric pressure is one millimeter or five millimeters. Therefore, one measurement with the tonometer is of no value at all. But the measurement, day by day or hour by hour, to show the variation in pressure of that eye, is of value. It is a question of relativity. Therefore, our tonometric measure must be made in the form of a curve before it spells anything to us at all.

There are one or two other minor points we must lay stress upon in our tonometry, because it is almost impossible for us to make such tonometric measurements perfectly. The tonometer is so constructed that it must be applied directly over the central area of the cornea, and, furthermore, the eye must be so located that the anteroposterior axis of the eye is directly vertical and that the stilette of the tonometer is a continuation of that anteroposterior axis of the eye. That sounds simple, but in practice it is extremely difficult to have the patient hold his eye in a satisfactory position so that the anteroposterior axis is vertical and so that the stilette is a continuation of that anteroposterior axis. Variation of 1 mm. or more from the central location of the cornea and the deviation of maybe only eight degrees from absolute verticality is sufficient to introduce an element of error into the tonometric measure that may vitiate the entire result. Again all pressure must be eliminated. In the average eye it is easy to pull down the lower lid against the zygoma and to elevate the upper lid against the superior rim of the orbit, so that all pressure is removed, but in some eyes it is not so easy, particularly in eyes of the protruding type. And in those eyes we are apt to have intra-ocular pressure registered by the tonometer higher than it actually is.

Again, the posture of the patient makes a difference. Many men are inclined to use the tonometer with the patient seated and the head thrown back resulting in pressure on the jugulars and in the normal eye there is

a slight variation of intra-ocular pressure coincident with the blood pressure.

Corneal anesthesia must be complete and it should be of the type that does not produce any dilatation of the pupil.

As to the tonometer to use, the most satisfactory today is the Schiotz and its modifications. That has stood the test of time far better than anything else and it is based upon correct principles.

Tuberculosis of the Eye

Tuberculosis of the eye embraces one of the most common of inflammatory eye conditions, chronic phlyctenular ophthalmia. Ocular tuberculosis is rarely primary in the eye.

Just as Hutchinson teeth often direct immediate attention to a syphilitic etiology, so certain changes in the eye, if recognized and given their proper interpretation will direct a more careful examination of the lungs. The result will often be that findings, which at a former examination might have been disregarded, are now more than suspicious.

F. C. Blackmar[6] draws attention to the fact that tuberculosis in the eye is divided into two classes, one of which is very rare and the other very common. It would be well for all general practitioners to be conversant with the more common type of lesion as a sign of tuberculosis somewhere else in the body. (Fig. 46.)

In the active type tubercle bacilli are present and cause typical changes with which we are so familiar in other parts of the body. In this type the pathologic unit is the miliary tubercle. There may be ulcers of the conjunctiva or tumors inside or outside the eye composed of many of these tubercles growing together. These usually rapidly progress to destruction of the eye.

(6) Jour. Med. Ass'n Georgia, December, 1924.

Luckily the conjunctiva is immune to infection by the tubercle bacillus brought to the eyes by dust, fingers, and the like, unless it has recently been injured. If it were not for this fact we would be surrounded by tuberculosis of the conjunctiva on all sides.

The second type is more common and more difficult to demonstrate as definitely tubercular. Usually there are only doubtful tubercular findings elsewhere in the body. In this type we do not find tubercle bacilli or

Fig. 46.—Tuberculosis of the eye. (Blackmar's case).

any of the changes so common in tuberculosis. In phlyctenular ophthalmia, which is illustrative of this type, the pathological picture is one which we would have with any localized inflammation of the conjunctiva.

These cases give positive family histories almost without exception, and positive Von Pirquet reactions. They

are probably better controlled by injections of tuberculin than by any other therapeutic agent. It is usually impossible to get any more definite evidence of tuberculosis than this. The physical signs in the lungs are usually doubtful or absent all together. The *x*-ray shows only slight evidence if any.

The etiology of phlyctenular ulcers of the eye is not such a simple matter as latent tuberculosis alone. Other elements also enter into it.

In recurrent phlyctenular ophthalmia the underlying cause is latent tuberculosis elsewhere in the body, although these patients are almost always in excellent health and it may be difficult to find absolute proof of tuberculosis.

Several cases have been reported which show how insignificant a tubercular lesion may be to cause this mild type of lesion. In these cases no evidence could be found of tuberculosis. Finally the tonsils were removed in the hope of helping the patient's general resistance. Sections of these excised tonsils showed many unsuspected tubercles, and there were no recurrences.

In an eye which had been enucleated and sent to the Army Medical Museum, the pathological findings were reported to be "old tuberculous sclero-keratitis, now markedly active."

The author has taken phlyctenular ophthalmia as representative of the latent type as contrasted to the bacillary or active type which is less seldom seen. Ocular changes less consistently due to small amounts of tubercular toxins are scleritis, episcleritis and very infrequently interstitial keratitis.

After an experience of fifteen years in the use of tuberculin, H. B. Gratiot[7] believes that its use for the purpose of diagnosis in disease of the eye is not a simple procedure but one requiring very close observation and study to correctly interpret the findings.

In administering old tuberculin subcutaneously for

(7) Jour. Iowa State Med. Soc., February, 1925.

diagnostic purposes we may expect three reactions in the event of an existing tubercular infection. The constitutional reaction of which the most characteristic symptom is a rise in bodily temperature eight to ten hours after the injection; a local reaction at the site of the injection characterized by redness, swelling, and induration, and the focal reaction occurring about the site of the tuberculous lesion.

If we are satisfied with the questionable value of a local reaction as corroborating our suspicions of a tubercular eye disease we will have a large array. If we go a step farther and require the constitutional reaction as essential evidence the array of tubercular eyes will not be as large a yield as the local reaction indicated, and going still farther and demanding the constitutional and some manifestation of a focal reaction in the eye as the only specific evidence that the disease is tubercular or, more probably dependent on tubercular toxines our number will be still further decreased but near the right proportion.

Clinically, diseases of the eye resulting from remote tubercular foci are not uncommon while tubercular foci situated in the eye or its appendages are quite rare. Under the author's observation in a series of 160 cases suspected of being either tubercular or dependent upon a remote tubercular infection 64 were positive to tuberculin, but only five out of that series actually had tubercular changes in the eye.

To obtain the focal reaction in the eye from the subcutaneous administration of diagnostic doses of tuberculin is not always possible in the presence of a tubercular eye affection, but it can be safely obtained more often than is generally granted. In some instances the focal reaction is not desirable.

Preliminary to giving the initial injection of tuberculin we assure ourselves that the patient is free from any active tuberculosis which might be stimulated into further activity by large doses of tuberculin. If the

individual is of good general appearance, with negative family and personal history, negative urine, and maintains a normal bodily temperature, over a period of several days, we are safe in giving tuberculin. If there is a history of a previous tubercular infection which is now quiet or cured, tuberculin should not be used regardless of the physical condition the patient may be in. Individuals with old healed tubercular areas in the lungs who have recently had an acute cold, or other acute infection, should not be subjected to large initial doses of tuberculin. These patients will react more vigorously to tuberculin and large doses are not necessary. Persistent fever from any cause is a contraindication.

Precaution is also necessary in regard to the condition of the eye. If the disease involves the choroid, retina, or optic nerve a severe focal reaction is to be avoided. There are several reported instances, however, of severe focal reactions in intra-ocular tubercular lesions which leave temporarily clouded vision, and then rapidly improved resulting finally in apparent cures.

It is probable that an element of good fortune rather than good judgment presided over these patients.

In diseases of the choroid, retina, or nerve, it is probably the safer plan to accept the corroborative evidence of the local and mild general rather than run the risk of a focal reaction. Mild focal reactions have occurred in the choroid in two instances from 5 10 milligrams of tuberculin administered subcutaneously.

In suspicious cases of disease of the posterior segment of the eye ball we may gain valuable information by instituting the tuberculin treatment and watching the results. If the disease is of the anterior segment of the eye ball involving conjunctiva, cornea, sclera, iris, or ciliary body, we need have no fear of the results of a focal reaction.

In order to be able to recognize the focal reaction when it occurs, it is necessary to make a careful study of the exact condition of the eye before administering

the tuberculin. In cases of corneal ulcer the exact size of the ulcer, if single; the area staining with fluorescin and the surrounding infiltration are all carefully observed and recorded. If the ulcers are small and multiple, they are counted and their location recorded. Note is also taken of old scars. Fluorescin is used to stain all areas denuded of epithelium.

In episcleritis and sclerokeratitis the redness and amount of swelling surrounding infiltrations is carefully noted. Fluorescin, or better, mercurochrome, is used to determine the amount of abrasion of the overlying epithelium.

In cases of iritis and cyclitis the accompanying pericorneal injection is observed together with any existing synechiae, and the amount of exudate on the anterior surface of the lens.

In the choroid and retina the number, size, and situation of the areas involved are noted. If there are scotomata they are carefully mapped; vitreous exudates are also taken note of.

More reliable results will be obtained if the tuberculin test is instituted before the eye disease has reached its height, or better still, when the subsiding stage is well under way. If the test is made during the active stage of the disease an exacerbation of the inflammatory symptoms may easily be interpreted as a focal reaction from the tuberculin. Since the majority of cases of diseased eyes dependent upon remote tubercular foci have long or short intervals of inactivity, it is not difficult to select a time when the exacerbation is just starting or ending when a subcutaneous injection of tuberculin will precipitate the attack or will stimulate it into renewed activity.

As a general rule the best time to carry out the tuberculin test is during the early subsiding stage of the inflammatory symptoms. In the beginning one is less certain just what changes are going to manifest them-

selves and a sudden increase of the symptoms may be mistaken for a focal reaction.

Preceding the initial dose the patient is instructed in the use of the clinical thermometer and how to take and record the temperature at three hour intervals during the waking hours of the day for four or five days. As the majority of the patients are ambulatory they continue their usual routine before and after the administration of the tuberculin. The ideal way is, of course, hospitalization, but this compels unnecessary expense and loss of time and if the patient possesses ordinary intelligence the test can be carried out satisfactorily at home.

Acute colds are contraindications to the administering of tuberculin in diagnostic doses because the cold may cause an increase of local symptoms and simulate a focal reaction. Convalescents from acute contagions are not good subjects for tuberculin and either a lapse of several weeks should be allowed or, in urgent cases, small doses used, as such patients are more susceptible to the influence of tuberculin.

The best time to administer the serum is between ten and twelve o'clock at night so that the constitutional reaction may occur during the waking hours.

The usual site for the injection is the arm, which has the merit of convenience, but if the patient is working, the soreness from the local reaction may prove very inconvenient especially if several injections are given. In these cases the injections in the back between the scapulae affords a better site.

The preparation used is Old Tuberculin, which is now put up in convenient form by several reliable commercial houses. Probably the most uniform and reliable results may be obtained by selecting one preparation and becoming familiar with its use.

If the preliminary observations have indicated a healthy adult, free from symptoms indicating a possible active tubercular infection, aside from the eye disease,

and this is not one contraindicating a focal reaction, the initial dose is given for the purpose of producing a focal reaction. Three milligrams injected subcutaneously are given for the initial dose, and constitutional reaction may be expected in eight or twelve hours after the injection. In rare instances it may occur as early as six or as late as 36 hours. If no reaction occurs in 72 hours the dose is increased to six milligrams, and at the end of the next 72 hours ten milligrams more are administered; if there is still no reaction we are justified in ruling out any tubercular influence.

After the initial dose of three milligrams if there is a marked local reaction consisting of redness, induration, and swelling at the site of the injection, the initial dose of three milligrams is repeated, instead of an increased dose, and usually the desired reaction will occur. In the event of a constitutional and local reaction, without the focal reaction, it is not deemed wise to carry the test farther.

Since the most important symptom of a constitutional reaction is fever, the patient is instructed to begin recording his temperature as early as possible the morning following the injection, and continuing to do so at two-hour intervals until midnight. As was before mentioned, the constitutional reaction may, as a rule, be expected from eight to twelve hours after the injection. It reaches its height six to eight hours later and then gradually subsides. The focal reaction is usually coincident with the constitutional.

The patient is not instructed to look for any change in the eye, otherwise his attention will be constantly fixed on his eye and he will interpret every little pain as a part of the expected reaction, and by the time he reports back to his physician, will have had an imaginary focal reaction, his account of which may make one question the value of his whole report. The patient should come under observation as soon as possible after the reaction begins.

The most characteristic manifestations of the focal reaction in an inflamed eye are increased redness and lacrimation. If the tuberculin has been given in the subsiding stage of the inflammation, the disease will be augmented.

In cases of single corneal ulcer there will be in addition to the redness and lacrimation, a larger area of denuded epithelium shown, when fluorescin is instilled, than had existed before the reaction. When the ulcer is situated in an old scar, the result of previous attacks, the entire area occupied by the scar will become denuded of epithelium. In multiple marginal ulcers, more ulcers will appear and old scars of previous ulcers will become active, denuded of epithelium and will stain with fluorescin.

The patient is not always aware of the focal reaction and at times it is impossible with the most careful observation to determine whether or not a focal reaction has occurred.

Rapid improvement in the eye symptoms following the local and constitutional reaction is quite conclusive that there was an unrecognizable focal reaction and the diseased eye was dependent upon tubercular foci.

The three reactions do not always run parallel. A focal reaction probably never occurs in the absence of a constitutional reaction. Occasionally it appears that the focal reaction occurs several hours later than the general and the local, but probably they had escaped attention until the symptoms reached their height. A very decided local reaction without any manifestation of a general is not uncommon and some local reaction usually occurs in about 80 per cent. of those injected.

The dose of tuberculin to be used in a given case cannot be arbitrarily fixed; each one must be worked out according to the indications of each individual case. Children should, of course, never be subjected to large doses.

Any inflammatory disease of the eye persisting for an

unusually long time without any assignable cause is an indication for the use of tuberculin for diagnostic purposes. It should be used along with serologic examination of the blood, examination of the teeth, tonsils, etc., to discover if possible the underlying cause of the trouble.

Accessory Sinus, Teeth and Tonsils

Ethmo-Sphenoiditis and Diseases of the Eye. Of all the accessory sinuses, the ethmoid and sphenoid are least understood. The etiology of disease in other organs leads us frequently to disease of the ethmoid labyrinth and sphenoid sinus, as a predisposing cause.

W. M. Thompson[8] attempts to correlate and systematize all of the more or less limited information on the subject from the experiences and investigations of others, which are in harmony with the results of a fairly thorough study of, and a rather wide experience in this, one of the most important, if not the most important field, in the realm of the otolaryngologist. The ethmoid labyrinth and sphenoid sinus bear a peculiar anatomical relation to each other and to the surrounding parts.

The optic chiasm and the pituitary body lie on the roof of the sphenoid cavity, and the canal through which the optic nerve and its accompanying vessels pass, lies within its inner lateral wall. Meckel's ganglion lies on its external antero-lateral wall between the sphenoid cavity and the most posteriorly located cells of the ethmoid labyrinth.

As in the study of the anatomy of this region we find it developed during early childhood, so in the study of the etiology of disease in these parts, we go back to childhood to find the beginning development of the predisposing causes of disease. There is undoubtedly a

(8) Ill. Med. Jour., June, 1925.

hereditary factor to be considered in a certain percentage of cases, for sinus disease has been seen to be present in several members of the same family at the same time, and in different generations of a line at different times. So also does environment, such as climatic conditions and ventilation of the sleeping-room play an important part in predisposing to disease in this region.

For several years Hajak, Saint Clair Thomson, and Sluder have recognized that most cases of optic neuritis are secondary in origin to disease primarily involving the ethmoid labyrinth and sphenoid sinus; but not until recently have they or any of their school realized what a great variety of diseases owe their origin to infections of, or a lack of ventilation in, these particular sinuses. Iritis, optic neuritis, choroiditis, keratitis, phlyctenular conjunctivitis, orbital cellulitis, and blepharospasm constitute only an incomplete list of the diseases of the eye and its appendages which have been proven to be secondary to disease of the cells under discussion. Other organs which have been found involved in the seemingly endless chain of diseases growing out of a primary involvement of the ethmoid labyrinth and sphenoid sinus are: the middle ear, heart, lungs, stomach and different members of the endocrine family, the latter system becoming involved undoubtedly through disease of the pituitary body, which, it will be remembered, bears a close relation to the sphenoid cavity.

The profession was for generations at sea as to the etiology in many of these cases, for the very good reason that there seemed to be a missing link. They did not connect disease in these organs with disease in the sinuses, for the reason that they did not know there was direct circulatory communication between the sinuses and the adjacent parts. But Uffenordi found vessels communicating between the membrane lining the sphenoidal sinus and the optic sheath in the optic canal—post mortem; Sluder found a lesion on the wall of the optic canal, on examination of the sphenoid cavity, after

removing the anterior wall, in a case of serous iritis; and Kleijn and Gurlach found an encapsulated diplococcus in the secretions and membrane of the sphenoid and the optic sheath, in the optic canal, and in the optic nerve—post mortem. These investigators have proved conclusively that there is direct communication between these sinuses and the adjacent organs. If we needed any further proof than this, we get it when, after placing a cocainized pledget of cotton on the lateral wall of the nose over Meckel's ganglion and waiting a few minutes, we find pain relieved in any of the parts of distribution of the sensory branches that pass through this ganglion. The effect of the anesthetic could reach the ganglion so quickly only through perfectly formed channels directly connecting the lining membrane of the nose with the ganglion; and if it is true in this case, why should it not be true in the case of the sinuses and adjacent organs or parts?

In view of this knowledge it would surely be unwise for the rhinologist to make a negative report simply because there are no subjective symptoms of nasal disease and no evidence of an active sinusitis. A careful examination of such a case will usually disclose a septum with a superior deflection, accompanied by an hypertrophied middle turbinate on one or both sides. There may be no evidence of disease other than a slight blanching of the mucous membrane over the turbinates, so that they appear waxy, and a distinct glistening of the surface of the membrane covering the anterior wall of the sphenoid; and transillumination and *x*-ray are both negative. But Hajak, Sluder and others have been able to demonstrate repeatedly that such a picture may be the primary cause of the very worst phases of secondary involvement of the eye and its appendages, or of an involvement of the heart, lungs, stomach or kidneys. It is not yet satisfactorily established whether the last named organs are affected by an auto-intoxication produced by disease in the ethmoid labyrinth and sphenoid

sinus, or through nerve-influence. The writer leans to the latter theory.

We have as yet found no satisfactory explanation for the fact that diseases secondary to the low forms of inflammation in this region should be more virulent than in the more active forms, but it has proved true in practice. Possibly the germ has spent some of its virulence during an active suppurative process of the sinuses, before it reaches the adjacent parts. We know that nature makes a valiant effort to prevent the spread of disease; and such an effort might cause the production of a sufficient number of anti-bodies to reduce the virulency of the germs.

Diagnostic Aids. Transillumination is of very great value in the examination of the maxillary sinus. One seldom fails to discover evidence of disease in this sinus by the use of this diagnostic aid, if the technic is right. This is also true of the frontal sinus, if we bear in mind the fact that there is often only one of these sinuses and that it may extend beyond the median line. Transillumination is of very little value in diagnosing disease in the ethmoid labyrinth and sphenoid sinus.

The *x*-ray is a very valuable aid, and no surgeon should undertake an operation on any of the accessory sinuses without previously having had a radiograph made of the region affected. Additional isolated ethmoid cells have been found anterior to the shoulder of the middle turbinate, also a partition in the sphenoid cavity, which thus produced two distinct cavities. In the absence of a radiograph of the field of operation, in the presence of either of the anomalies mentioned above, the operation would prove a complete failure.

All uncomplicated cases of acute suppurative sinusitis should be treated by the suction method. But with the first appearance of symptoms of complications involving the eye and its appendages, or other organs that may be affected by disease in the ethmoid labyrinth and sphenoid sinus, surgical interference should be adopted. If

the case has reached the subacute stage, unless there are some special contraindications, immediate operation is advised. In all cases of chronic suppurative ethmosphenoiditis, and in every case of hyperplastic ethmosphenoiditis with complications, it is wise to do a radical operation at once.

The Relationship Between the Eyes and the Teeth. Numerous instances of the intimate relationship existing between the eyes and the teeth have been noted in this series in recent years. H. M. Goodyear[9] contributes the following interesting case.

In a 25-year-old patient, the left eye was closed by a marked swelling which extended well down over the left cheek. The patient looked toxic. Twelve hours preceding there had occurred a severe chill with temperature of 103.

Two months previous the left upper second premolar had been extracted under local anesthesia. The root was badly abscessed and an opening into the antrum was noted following extraction. This opening did not close and two months later the eye complication suddenly arose.

There was a marked swelling about the eye which continued for several days with impaired movement of the eyeball. The conjunctiva was markedly swollen and protruding. There was a tendency to displacement of the eye upward and inward. There was no loss of vision or changes in the fundus.

Chills occurred daily and temperature rose to 105. The patient was restless and meningeal complications threatened. Irrigation of the antrum through the tooth socket gave a foul bloody return with increased pain in the eye.

An abscess on the floor of the orbit was suspected, and a curved incision was made in the area below the eye (Fig. 47.) With pointed hemostat inserted along the floor of the orbit a large abscess was evacuated. On

(9) Cincinnati Jour. Med., November, 1924.

irrigation through the incision water returned through the open tooth socket and nose showing that there was a fistula in the bony floor of the orbit. Through the incision uncovered bone could be felt in this area.

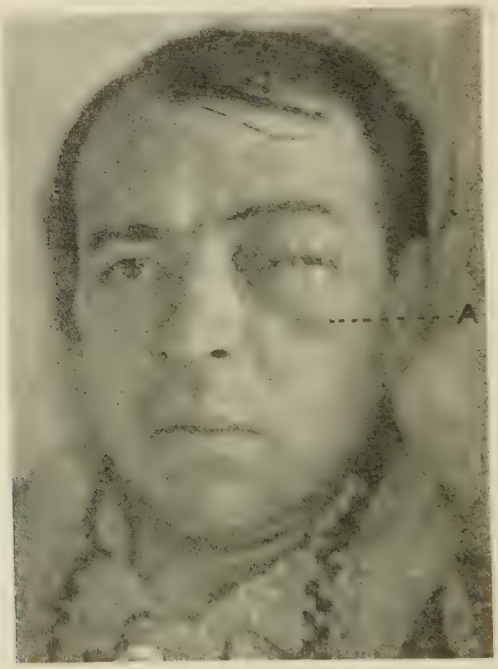


Fig. 47.—A—Point of incision.

Three days after draining the abscess a large opening was made through the left inferior meatus of the nose into the antrum. The antrum and orbital abscess were irrigated daily. Temperature dropped to near normal following the operation and chills did not occur. The swelling about the eye gradually receded and in two weeks the condition of the eye was good, save for some thickening of the conjunctiva. The vision was normal.

The fistula at site of the tooth closed in about eight weeks, and there was no undue discharge from the nose.

Upon healing there was a distinct tendency to an indrawing at the site of the primary incision which the patient massaged daily, loosening the tissues, and apparently obtained a perfect cosmetic result.

Injury to the floor of the orbit in probing a dental fistula is to be considered as the bony plate is often exceedingly thin and infection may be carried into the orbit. (Fig. 48.)

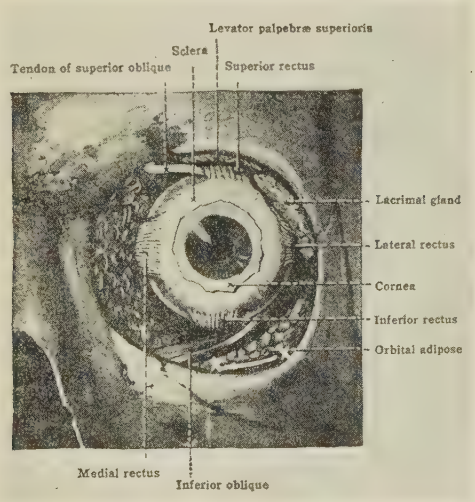


Fig. 48.—Left Orbit.

[Experimental investigation has proven that although the *x*-ray may show a tooth to be perfectly sound, the pulp canal of the tooth can be the seat of an infective process going on and disseminating the pathogenic bacteria or toxins through the blood stream into other parts of the body.—Ed.]

Blindness from Teeth, Tonsils and Accessory Sinuses. In an exhaustive article on this subject, L. E. White[1] emphasizes the importance of a correct knowledge of

(1) Boston Med. and Surg. Jour., Jan. 8, 1925.

the anatomical relationship of the optic nerve and the accessory sinuses. His conclusions coincide with others who have investigated along this line, that the size of the optic canal has much to do in determining the treatment and prognosis of acute optic or retrobulbar neuritis.

The etiology and pathology of this condition is explained, with the proper method of measuring the size of the optic canal. In order to determine what influence the size of the canal had on the best method of treatment, 36 cases with optic-nerve involvement were analyzed with the following results:

In ten cases the vertical diameter was 4 mm. or less, and all were oval. Two of these were benefited but slightly, if at all, by operation. One unoperated case had complete optic atrophy. Another refused operation and was unimproved. Four cases improved greatly after the opening of the posterior sinuses, but there remained marked temporal pallor. One required a tonsil operation, and the remaining case, unoperated upon because of poor general health, has had frequent recurrences. These were by far the most serious cases in the series.

There were ten cases with canals approximately 4.5 mm. in the vertical diameter, and of these but three were oval. Four had the posterior sinuses opened and all recovered with practically normal vision. Five had teeth or tonsils removed, and all these made good recovery. The remaining case recovered under local treatment. It is interesting to note that in these 4.5 mm. cases every one recovered with practically normal vision.

There were eleven cases with optic canals 5 mm. in the vertical diameter, and of these but two were slightly oval. In three chronic cases, where the etiology was in doubt, one showed marked improvement after removing the tonsils. A septum and tonsil operation on the second was followed by slight improvement. The third case, with progressive blindness, was temporarily improved in health and relieved of severe headaches, but

later had a brain tumor removed. Four acute cases had the posterior sinuses opened; normal vision in three and but slight improvement in the fourth. The neuritis in this case was apparently not of nasal or dental origin. Three acute cases recovered under local treatment. The remaining case made a good recovery following the removal of the tonsils and middle turbinate. Of the eight acute cases, seven recovered with normal vision, and in the obscure eighth case tabes or multiple sclerosis is suspected.

There was one case with canals 5.5 mm. in diameter. In one eye there was optic atrophy of many years' duration; the other eye, of six weeks' standing, improved rapidly after the removal of abscessed teeth.

There were three cases with canals abnormally large, *i. e.*, 6 mm. One of these, a case with progressive loss of vision, continued to fail after the sinuses were opened and the tonsils removed. The neuritis was later found to be due to a suprasella tumor. In the second case the vision returned to normal after the removal of the foci of infection in the mouth. The third case, untreated, had complete optic atrophy of two years' duration, probably from either abscessed teeth or an optic-nerve tumor.

Further analysis of these data reveals that in the 10 cases with canals of 4 mm. or less, diseased teeth were extracted in one and in another the tonsils were removed.

Treatment. If future cases substantiate the results in those already studied, it will mean that whenever we are dealing with canals of 4 mm. or less the appropriate treatment in a case of severe optic-nerve involvement will be the immediate ventilation of the posterior sinuses to prevent atrophy, unless some other definite focus can be found.

A 4.5 mm. canal does not demand such radical treatment. Optic atrophy, while possible, is less to be feared. The posterior sinuses, unless blocked or evidently diseased, rarely need to be opened. Local medication may

be given a reasonable trial. In canals of 5 mm. or over the neuritis is probably not a direct extension from the sinuses, and recovery from any acute attack may be expected either spontaneously or under local treatment. Later the focus should be sought and, if found, eliminated, be it in teeth, tonsils or sinuses, as the toxins from long-continued infection can produce atrophy even in normal canals. Local treatment is usually a 10 per cent. spray of argyrol and adrenalin about the middle turbinate, followed by hot irrigation or suction.

When no definite explanation can be found for sudden and persistent loss of vision in a patient with a canal of 4 mm. or less, the operation advocated as a therapeutic measure is the removal of the middle turbinate, a larger opening in the front wall of the sphenoid and the uncapping of the posterior ethmoid cell—a simple and comparatively safe surgical procedure to one at all skilled in intranasal technic. The complete ethmoid exenteration, unless the cells are definitely infected, does not seem to me either a justifiable or necessary procedure.

Eye Injuries and Emergencies

Eye Emergencies. Every physician is called upon more or less frequently to render emergency aid to injured or otherwise sick eyes. To the inexperienced, the efficient care of these patients may be a rather difficult problem, because of the usual impracticability in securing immediate outside information, either from books or associates.

In a lecture before a body of general practitioners, C. A. Bahn[2] points out some of the more frequent emergencies, for which first-aid treatment at least must be instituted, until the specialist can be summoned.

The most common ocular emergency is caused by for-

(2) New Orleans Med. and Surg. Jour., June, 1925.

eign bodies, usually in the cornea. Very few of our medical ministrations produce more and prompter happiness than the successful removal of an ocular foreign body, which involves anesthesia, neatly and completely removing the foreign body, and preventing pain recurrence.

[An extremely fine steel wire imbedded in the cornea is sometimes almost impossible to see against the underlying iris background. In such cases a drop of fluorescein instilled over the cornea will greatly facilitate its discovery and removal.—Ed.]

Anesthesia may be obtained with one or two drops of a 4 per cent. cocain, 2 per cent. butyn, or 2 per cent. holocain solution or ointment. The affected eye can be held open with a speculum, or fingers, either of the operator or assistant. Intense light and magnification, as well as ocular fixation, are often necessary.

It is important to remove the entire foreign body as quickly, and with as little damage to the eye as possible. Rust spots, which quickly form, because of their chemical irritation, materially delay healing. A scalpel, Graefe knife, Dix's spud or pointed hook-shaped needles, and so forth, may be used. More important than the kind of instrument is its cleanliness and its use from the side rather than the point, which upon a quick, uncontrolled movement, increases the danger of puncturing the eyeball.

Having removed the foreign body, our next problem is further relief from pain, usually dependent upon healing of the corneal epithelium, which generally takes place in from three to six hours. Pain may be lessened by the use of any non-irritating ointment, such as ordinary vaseline, with or without drugs, like yellow oxide of mercury 1 per cent., bichlorid 1/30 per cent., boric acid 10 per cent., on account of the minimized friction between the abraded cornea and the lid. More prompt and painless healing is perhaps facilitated by the incorporation of drugs which produce analgesia, stimulate

healing and minimize bacterial growth. We use, for this purpose, an ointment containing vaseline, 1 per cent. novocain, 1 per cent. balsam of peru and 2 per cent. orthoform, in small probe pointed collapsible tubes.

After removal of the foreign body, irrigation of the eye with any non-irritating solution and installation of an ointment as mentioned, preferably a gauze adhesive dressing is applied to the closed eye to minimize handling and infection, and the patient is instructed to keep both eyes closed as much as possible until the following day, when the cover is removed. If the eye is apparently well, the patient can resume work, if not, the patient is instructed to return for further treatment. It is practically impossible to immobilize one eye with the other eye open, hence the advisability of keeping both eyes closed to minimize pain, which is increased by friction.

Perhaps next in frequency are abrasions or slight surface defects, often following previously removed foreign bodies. The cause of this discomfort is difficult to see, because the distortion of the corneal reflex over the affected area, is often very slight and visible only with magnification or staining. The treatment is essentially that following the removal of foreign bodies.

Inverted lashes are a frequent cause of a sometimes sudden and apparently unexplained ocular discomfort. In removal it is important that the lashes are not broken because their stubby ends only aggravate discomfort.

In electric burns light sensitiveness is intensified to an extreme degree. In the slight forms we advise cold applications every one or two hours, avoidance of light, with dark glasses or confinement in a dark room, and the use of a bland ointment, preferably with holocain 1 per cent., applied every two or three hours. In more severe burns of this type, homatropin or atropin is of advantage. Electric burns are essentially light and not heat burns, and heal rather slowly.

Burns of the lids, conjunctivae and cornea, from heat

or chemicals in solid, liquid or gaseous form are also among the more common ocular accidents. Heat burns are perhaps best treated by first cleansing with any non-irritating solution at body temperature and then by applying vaseline or any other protective non-irritating substance to minimize exposure to air, which intensifies the pain. Dark glasses are of course a necessity whenever the eyes are oversensitive.

Our first thought in the treatment in chemical burns is naturally the neutralization of the irritant, which necessitates an understanding of its general composition. Alkali burns such as lime, lye and ammonia are perhaps best neutralized by ordinary sugar water which forms an inert saccharate, and is employed in the strength of about one teaspoon to the pint as an irrigation every hour during the first day. It is especially important in lime burns to evert the upper lid and remove every particle, because if left behind the lime comes in contact with, and further burns the cornea. Acids are best neutralized by a solution of ordinary baking soda, about one teaspoon to the quart, applied in the same way. If these solutions are not at hand, do not lose time, but wash the eyes out thoroughly and quickly with plain water; the chemical neutralization is a minor factor.

In this connection it is well to understand that the various solutions commonly used in the eyes, such as borax, boric acid, normal salt, and a legion of others, probably practical, have no bactericidal value whatever. They facilitate the removal of mucus and are non-irritating on account of their chemical composition and because they are isotonic with the tears; further than this they have no curative virtue whatever. Castor oil if not rancid is non-irritating and protective, if rancid, it is neither. Milk used as an ocular irrigating fluid has no particular value and can induce infection. Potatoes, meat, oysters, eye cups, and the many other applications used by the laity are to be condemned because they are

potentially dirty and facilitate infection. Atropin should be used only when positively necessary. Its indiscriminate and careless use often prolongs disability in eye emergencies and occasionally ushers in an attack of acute glaucoma which otherwise might not at least have occurred for many years. The use of cocain solutions by the patient to relieve pain is only mentioned to be condemned, because cocain especially when repeatedly used not only destroys the corneal epithelium but devitalizes the ocular tissues and delays healing.

Insect stings or bites on the lids or eyeballs are usually painful but seldom serious. Several days, preferably with the use of bland ointment and protective glasses and with as little handling as possible usually restore the tissues to normal.

Hemorrhages in the lid and conjunctivae of themselves are usually not important except when they evidence intracranial bleeding. In seven to ten days the tissues usually resume their normal color and size, probably as well with as without therapeutic aid. Poultices, leeches, and other methods of treatment apparently accomplish nothing except occasionally to increase the bleeding and introduce infection.

Lens dislocation, which may follow any injury to the ocular tissues, is one of the serious complications to which we have in the past not paid enough attention. It is especially important that industrial surgeons observe and record slight changes in anterior chamber depth and pupil eccentricity or distortion, in order that the victim, who will probably suffer a more or less complete loss of sight because of cataract or glaucoma, may have a better chance to recover the compensation which justice and the law provide.

In perforating injuries of the eyeball, we have the more serious ocular emergencies which may involve intra-ocular infection, iris prolapse, traumatic cataract, increased intra-ocular tension, retinal detachment, and so forth; conditions which are usually best taken care

of by the experienced. In the absence of apparent infection, irrigation with a clean non-irritating solution, the installation of a bland ointment and the application of a protective dressing affords, generally speaking, the best possible emergency treatment. The use of foreign protein injections, such as ordinary skimmed milk, 5 to 10 c.c., previously boiled about five minutes, injected into the glutaeal or scapular region, to increase infection immunity, is an experimental procedure apparently justified. If there is pus in the eye or other evidence of ocular infection, bandages should never be used, because retained infectious material only damages the tissues with which it comes in contact.

Occasionally contagious material such as gonorrheal pus comes in contact with the eyes. Immediate irrigation with a clean non-irritating solution probably minimizes as far as possible the danger of infection, which at least partially depends upon minute conjunctival abrasions. Let us not forget that in connection with our use of the so-called conjunctival antiseptics, any aqueous solution is diluted to approximately one-twentieth of its original strength in the conjunctiva within five minutes, hence the importance of using solutions such as argyrol, mercurochrome, and the legion of others (which may or may not have bactericidal value), not less than every thirty minutes, if any possible curative virtue is to be expected. The treatment of conjunctival infections of one sort or another is hardly an emergency and is probably best cared for by the experienced.

Among the most serious of ocular emergencies is acute glaucoma, which often begins with one-sided eye or head pain and in which the cornea is usually dull, the anterior chamber shallow, the eyeball always hard to the touch, and sometimes the pupil is large. The use of pupil dilating drugs such as atropin only produce irreparable harm. Never use atropin unless you are sure that it will do no harm and that it is positively needed. Drugs which contract the pupil, such as eserin 1/5 per

cent. or philocarpin 1 per cent., solution or ointment, should be used at least three times daily in all cases in which the eyeball is apparently too hard, until expert advice is obtained.

Industrial Eye Accidents. Frank Allport[3] considers this subject under two headings: first, cause and prevention; second, treatment.

Cause and Prevention. Applicants for employment should be examined for ocular deficiency before employment is given, and afterward at stated intervals, or when occasion arises. Examinations should be made by oculists, and not by general practitioners or nurses, and should be accurate but liberal in character. Examinations are beneficial to applicants, for they may reveal ocular defects amenable to treatment, or unfold conditions indicating where and how applicants can work to best advantage and with a minimum amount of ocular damage. Examinations are also necessary to the other employees, for they exclude from shops, and the like, contagious diseases and other ocular conditions menacing their safety.

The proper illumination of shops, offices, mines, and so forth, is greatly conducive to ocular health. Employees perform their best and safest work under suitable illumination. Ample daylight is the best illuminant, and artificial illumination should simulate daylight as nearly as possible. Illumination should be ample, well directed and not glaring or excessive. Employees should be able to work without conscious ocular effort.

Most of the shops are glad to furnish suitable goggles to employees who will wear them. Their use is becoming more and more prevalent. All employees subject to shop accidents should wear them. The Pullman Company, The American Steel Foundry Company and other shops are enthusiastic concerning their use, and produce extremely encouraging statistics.

Employees should not remove foreign bodies from the

(3) Amer. Jour. Surgery, January, 1925.

eyes of their fellows. They do not understand such work, nor its importance or possible disastrous consequences. Their hands and tools are dirty, and they have no conception of asepsis.

No reasonable contrivance that may possibly defend the visual power of employees should be disregarded. Any other course is inhuman, and uneconomical to the employer. Shops should be cool, clean, and as nearly dustless as possible. Tools should be kept in perfect condition. Hammers, especially, should be frequently inspected, as so many accidents occur from hammers with softened or mushroomed edges. Emery wheels should be well protected. Molten metal vats should be handled carefully, and be well protected, and workmen handling this dangerous liquid should have their faces protected with masks containing goggles. Men working in great heat or excessive light as, for instance, when facing blast furnaces or where electric welding is done, should not work there long at a time, and their eyes should be protected by blue or red glass screens and amber goggles. Miners' nystagmus is largely caused by deficient illumination, poor headlights, and working in a recumbent position, and it can be greatly diminished by better illumination, better headlights, white-washed walls, and working in the erect posture when possible.

All occupations have their dangers. Relief measures for such dangers are continually increasing. It remains with employers and employees to utilize all measures for safety. Employers should provide all sensible safety devices, and urge their employment by personal persuasion and printed propaganda. Employees should gratefully accept such devices and constantly place them in service. This would insure—not the obliteration of accidents, but an enormous diminution in their number.

Treatment. Minor ocular accidents may become exceedingly serious if improperly treated, and even, indeed, if properly treated. The removal of foreign bodies from the cornea, when properly executed, is usually

a very simple affair. It must, of course, be done aseptically, under local anesthesia, with ample illumination, and under magnification. Particles may frequently be brushed off the cornea, by a cotton-guarded applicator, but, if more firmly lodged, a Graefe knife, or spud, will be necessary. The cornea must be scratched as little as possible, for every scratch leaves a scar, and every scar diminishes vision, especially if centrally located. Operative trauma also invites infection, and serious damage is sometimes produced by a careless operator. Some particles are deeply imbedded and difficult of removal. The spud or knife should get *under* them, and *lift* them out, instead of scratching or picking around on the surface. Some particles during efforts at removal even drop through the cornea, and into the anterior chamber, whence they must be rescued by incision, irrigation, forceps or the magnet. Some particles have a traumatized or sloughy base after removal, which should be cauterized by carbolic acid or some other cautery. Foreign body removal cases should usually be treated by irrigation, atropin, argyrol, bichlorid of mercury ointment, a bandage and quiet. Some recover quickly; others are followed by infection, iritis, panophthalmitis, and so forth, and should be cared for accordingly, never forgetting that patent causes for trouble may be found in the lacrimal apparatus, the conjunctiva, sinuses, tonsils, teeth, kidneys, in syphilis, gonorrhea, and so forth.

When the foreign body penetrates the globe and remains lodged in it, a most serious condition confronts us. The author assumes that the foreign bodies are of steel, as they usually are. Foreign bodies may, of course, lodge anywhere. Spindling particles may stick in the cornea, with one end in the interior chamber and the other end outside the cornea. They can be removed by forceps or magnet, or the foreign body may be in the anterior chamber, iris, lens, vitreous chamber, sclera, or in the tissues of the orbit. If in the anterior chamber,

iris or lens, the fragment can usually be seen by illumination and magnification, but, if it is located posterior to the lens, or sometimes even in the lens itself, the *x*-ray will be required to indicate the locality. Ophthalmoscopic examinations are generally not especially valuable in detecting the presence and location of foreign bodies within the globe, although information can sometimes be obtained this way, and it should always be used. He protests against using the magnet as a diagnostic instrument, as the damage produced frequently outweighs the value of any information obtained.

Reliable *x*-ray pictures can be made only by an expert, and even then they sometimes deceive one way or the other. The ocular interior is a small cavity, if the quadrant of the globe where the invader is lodged is clearly indicated by good *x*-ray plates, the point of operative procedure should be well understood, and a good magnet has sufficient drawing power to remove the steel, unless it is held back by some serious retention. Localization is chiefly useful where doubt exists as to whether the foreign body is in the posterior portion of the lens, or firmly lodged in the sclera, or has passed completely through the eye, and rests in the tissues of the orbit.

In the latter condition, it is best not to interfere—so far as a magnet operating is concerned, for its removal by magnetic attraction is evidently impossible, unless a curved magnet point is passed into the socket, *around* the eyeball, and this procedure can hardly be either advisable or profitable. Small particles in this location are practically harmless, and large ones will produce so much ocular trauma that enucleation is advisable, and with it the removal of the large intruder. Fragments are sometimes lodged so firmly in the sclera that the magnet will not displace them, although a very strong magnet persistently and properly applied will almost always be successful. Loose or comparatively loose fragments are sometimes so covered with exudate that their

removal is slow, but they always respond to the magnet in the end, while those that are uncovered usually present themselves without much difficulty. Contrary to the opinion of some, foreign bodies in the lens should always be removed. Cataracts in such cases are always present, and the cataractous lens and foreign body can usually be expelled at the same time, or the magnet may be used if the particle is reluctant. Ample corneal incisions should be made in traumatic cataracts. Such lenses often have more consistency than one suspects, and it is dangerous to attempt delivery through a diminutive exit, and not much pressure on the eyeball should be made.

Foreign bodies in or anterior to the lens should be removed through the cornea, and all others should be removed through the sclera, unless the entrance wound is still open, the lens cataractous, and the foreign body small in which case the anterior route may be selected. The dangers of the posterior route are actual, but not comparable to the dangers of the anterior route, if the foreign body lies back of the lens, and it is swiftly and relentlessly dragged over the most sensitive portions of the eye anatomy. Anterior route operations should be confined to foreign bodies that are situated in or anterior to the lens (with the exception already noted), and where the particle can be withdrawn without leaving ciliary or other misfortunes behind.

With regard to foreign bodies located in the vitreous chamber, their presence and location having been indicated by *x*-ray pictures, the operation is to be performed at one of the four quadrants of the eye, nearest the site of the foreign body, between two of the recti muscles. The author describes the technic of the procedure in detail.

Many traumatic cases are so manifestly hopeless at the start that immediate enucleation is the only rational, safe and conservative course to advise. Other cases, more hopeful at first, finally succumb to hopeless irido-

cyclitis, panophthalmitis, and so forth, and enucleation, and it must be remembered that many cases of steel extraction, where operative procedures have apparently been crowned with success, finally—after some months—must be regarded as utter failures, owing to profound intra-ocular lesions, due to trauma or the necessary operative interventions.

The important practical question of compensation claims is then briefly discussed. Such cases are usually tried first by a rather informal court—held by an Industrial Commission and these trials dispose of an enormous number of small cases, and have become a necessity. Decisions rendered are sometimes bewildering to the honest medical witness, who cannot understand why such peculiar verdicts are pronounced. One great reason for misunderstanding between courts and medical witnesses is the improper conception of Snellen's test types, and the fractions indicating visual acuity, and the inability of our profession to agree upon a table or rules formulating visual losses. For instance 20-40ths of vision was supposed to denote one-half loss of vision, whereas we all know that 20-40ths of vision does *not* cut off one-half of a man's visual capacity for work. Snellen never intended his fractions to indicate such a fact. They were devised only as an international language to indicate refractive conditions. This has caused great confusion in settling claims, and, although the error is now understood by most ophthalmologists and many courts, it is still a bone of contention that ophthalmologists should do their utmost to correct. Various individuals and committees have undertaken to construct tables indicating visual losses from industrial accidents. Most of them are so elaborate and technical, and endeavor to cover so much ground, that, while they *may* be clearly understood by their authors, they are not understood by the profession, and much less by employers, lawyers and courts.

The first necessary step in the clarification of this

problem is a clear and tangible table for the settlement of monocular industrial visual losses. It must be understood, however, that no cold table of figures can completely compute visual deficiencies; it can operate only as a basis for professional and legal opinions; the balance of the problem must be worked out by the medical expert and the courts. A Compensation Table for monocular visual loss must be based on two simple, obvious facts: first, normal vision must be estimated as 20/20ths; second, industrial blindness must be estimated as 20/220ths of vision. Concerning the latter, a man is, of course, not actually blind if his vision is 20/220ths. He can earn money in some way, but he is sufficiently bereft of vision to denominate him as "industrially blind," for which he should receive full compensation if his case can be proved. Between these two extremes of vision, *viz.*, 20/20ths and 20/220ths, equal and mathematically correct graduations of vision should be estimated. A somewhat modified table devised by V. A. Chapman of Milwaukee, is perhaps the most understandable and mathematically correct table before the professional and business world at the present time.

		Visual efficiency	*Loss of vision*
1	20/20 indicates	100%	0%
1	20/30 indicates	95%	5%
2	20/40 indicates	90%	10%
3	20/50 indicates	85%	15%
4	20/60 indicates	80%	20%
5	20/70 indicates	75%	25%
6	20/80 indicates	70%	30%
7	20/90 indicates	65%	35%
8	20/100 indicates	60%	40%
9	20/110 indicates	55%	45%
10	20/120 indicates	50%	50%
11	20/130 indicates	45%	55%
12	20/140 indicates	40%	60%
13	20/150 indicates	35%	65%
14	20/160 indicates	30%	70%
15	20/170 indicates	25%	75%
16	20/180 indicates	20%	80%
17	20/190 indicates	15%	85%
18	20/200 indicates	10%	90%
19	20/210 indicates	5%	95%
20	20/220 indicates	0%	100%

With this table as a foundation upon which to work, all such questions as optic atrophy, strabismus, corneal, lenticular and vitreous opacities, iritic adhesions, diplopia, choroiditis, retinitis, necessary changing occupations, and so forth, can be worked out by the medical expert, lawyers and the courts.

Ocular Therapeutics

Tinted Lenses and Their Uses. Much has been written about the ultra-violet rays and their destructive effects on the eyes. The general public had become imbued with a haunting fear of daylight, so that the wearing of glasses which eliminated ultra-violet rays had become a fashion. Tinted glasses seemed to be prescribed in an indiscriminate and indefinite way, with the idea of getting rid of the ultra-violet bugbear. But what was the real truth about the human eye and its susceptibility to ultra-violet rays? Sir Arnold Lawson[4] in an address before the Royal Society of Medicine stated that a great deal of protection was afforded by the cornea and the crystalline lens, especially the latter, against ultra-violet excess. Only ultra-violet of a very narrow and harmless range of wave-length—a small proportion of the possible ultra-violet radiation—reached the retina under normal conditions. Ordinary sunlight in the lower altitudes was rather poor in ultra-violet; the eye was constructed to allow the ultra-violet rays of ordinary sunlight to pass harmlessly to the retina, and a certain excess was excluded by the protective properties of the eye itself. There was no need, therefore, in the normal person to protect the eyes from ordinary daylight, and what he had been saying about the ultra-violet applied equally to the infra-red.

Snow-blindness was not due so much to excess of exposure to ultra-violet radiation as to excess of exposure

(4) British Med. Jour., Oct. 18, 1924.

to infra-red. Various occupations required special adjustments. Acetylene working, for instance, exposed the worker to an intense ultra-violet radiation; glass-working to heat radiation.

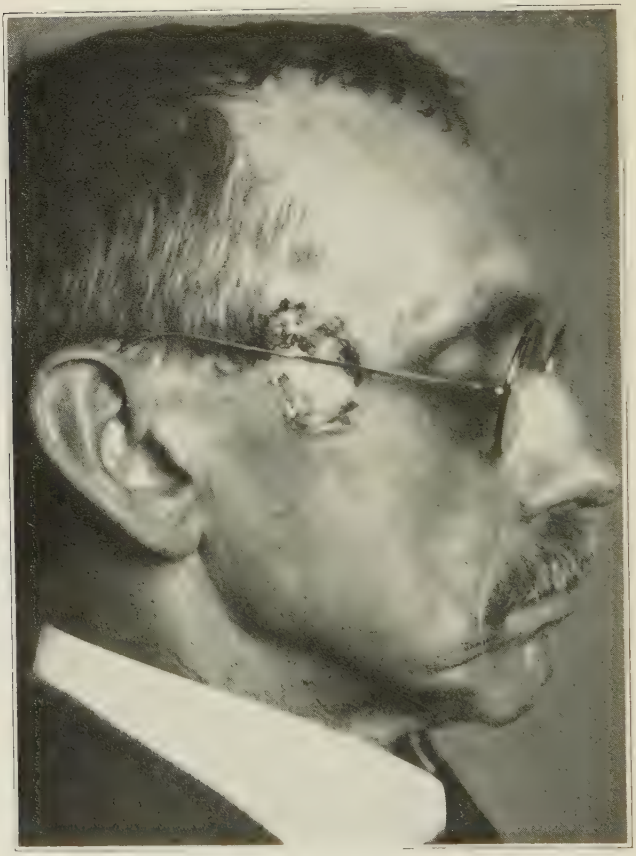
The thickness of the glass was an important factor. Peacock blue of 2 mm. thickness shut off the red, orange, and part of the green, and also interfered with the blue and violet, and eliminated the ultra-violet, but similar glass 0.5 mm. in thickness let through a great deal more both of the red and of the violet. The absorption factor in the case of thin glass was enormously lessened.

Taking glass of 2 mm. thickness, the result of the author's investigations was to show that the old London smoked glass, from the point of view of protection against ultra-violet radiation, was almost as good as the deeper shades of Crookes glass, and that as regards the red end of the spectrum it was better than the Crookes. If it was desired to eliminate both ends of the spectrum peacock blue should be used. The violet end of the spectrum was absorbed best by fieuzal glass. Crookes A and A2 were not really tinted glasses at all, but they furnished a useful way of protecting a sensitive eye in mild glare, and they did not disfigure the face or alter the color values. For patients with healthy eyes but who were physically or mentally abnormal Crookes glass, especially B and B2, was excellent; but too much protection should be discouraged, and as the patient improved in health the wearing continuously of some kind of tint should be gradually abandoned, because it was likely to become a pernicious habit. Cataract due to glass-blowing was caused by infra-red rays, and tints such as fieuzal 4 or 5 or peacock blue afforded the best prophylactic. Nothing was more harmful in the early stages of cataract than exposure to bright light of any kind. In cases in which a habitual tint was wanted there was nothing more comfortable than Crookes glass, but in active inflammatory diseases of the retina and choroid peacock blue is preferable.

PLATE XIII.

Cutaneous horn.—Morton, page 213.

PLATE XIV.



Basal cell cancer.—Morton, page 213.

The Menace of Poorly Fitted Spectacles in Old Persons. Although it has been known for many years that chronic irritation plays a part in the localization of malignancy, little attention has been called to the mechanical injury caused by spectacles. Herz did report a basal cell cancer of the nose apparently due to the constant rubbing of glasses, and raised the question as to the frequency of such a finding. Three other writers have incidentally mentioned spectacles as the probable agent responsible for some of the cancers in their series of cases.

It seems that there must be many more such cases not recorded, as four have been seen by J. L. Morton[5] during a short time and in a small series. A brief summary of these cases is reported, and the author concludes that poorly fitting spectacles can be a real menace to their wearers. This is especially applicable in those beyond middle age, and the danger is considerably increased when senile changes have taken place in the skin of the irritated area. One should be mindful of this possibility and should take every precaution with the proper adjustment of eyeglasses. (Plates XIII and XIV.)

The places where constant abrasions are to be avoided are the bridge of the nose, the sides of the bridge near the inner canthi, the temples and at the back of the ears. In the four cases reported, the temples were affected in three instances, and the fourth lesion occurred behind the ear; but in Sutton's cases and also in Herz's case, the nose was involved. Owing to the tendency for basal cell cancer to occur most commonly on the nose, it is probable that most growths arising in irritation from spectacles will occupy this position. It would seem *a priori* that spectacles of the pince nez type would be especially liable to cause trouble, but no data are available to support this assumption.

In view of the possibility of malignancy occurring in an irritated area, one should take the responsibility

(5) Jour. Amer. Med. Ass'n., Feb. 28, 1925.

of impressing on patients the necessity of promptly attending to any maladjustment of their spectacles.

Radium in Ophthalmology. The use of radium in ophthalmology has been confined largely to treating malignant growths, but we find more encouraging results in the reports of those treating non-malignant affections of the eye with radium.

Laura A. Lane[6] details the treatment by radium of nine cases, including diseases of the lids, vernal conjunctivitis, pteryguim, and corneal opacities, all of which responded successfully to this form of treatment. Thirty additional cases are still under observation.

In more than two years' experience, no burns or other untoward effects have yet appeared. No other treatment has been used except atropin, warm boric acid for cleansing secretion, mercurochrome-220 soluble in one ulcer case, external heat as indicated, and antisyphilitic treatment in the interstitial patient while the radium was being used. In many of those patients the results have been far more satisfactory than with the usual methods of treating such conditions and far more agreeable to the patients, as the treatments have been painless.

The author regards radium a specific in vernal conjunctivitis, trachoma and certain lid lesions.

Tutocain. Tutocain has been used as an anesthetic by G. C. Dixon[7] for the past year or more in about one hundred cases. Fresh solution is advised, the addition of salicylic acid proving too irritating.

For superficial work a 1 per cent. solution proved satisfactory. Onset of anesthesia is somewhat later than with 2 per cent. cocain, but the degree of anesthesia ultimately obtained is the same. For deep anesthesia a 5 per cent. solution was used; this appeared to produce an effect almost exactly the same as that given by 4 per cent. cocain. The loss of sensation was in every

(6) Jour. Amer. Med. Ass'n., Dec. 6, 1924.
(7) Lancet, May 2, 1925.

case good, and the duration of anesthesia was always sufficient for the purpose used; but no special tests were employed to determine the latter.

The weaker solution (without preservative) is quite unirritating. The stronger is perhaps slightly irritating, but very little more than cocain. No case of late irritation or damage to the epithelium was observed. On application there is definite injection of the conjunctiva; the addition of weak adrenalin controls this. Some drying of the cornea tends to occur, but this is less than that found with cocain.

The pupil is dilated by tutocain. This occurs much more slowly than with cocain, and is of less extent.

No evidence was obtained of any toxic effect.

The Use of Epinephrin in Ocular Hypertension. Since Hamburger reopened the question of the local use of epinephrin for the purpose of reducing increased intra-ocular tension, the literature has been replete with many a pro and con on that subject. All investigators have injected the solution subconjunctivally, and only recently has mention been made of the use of an epinephrin ointment. For the last few months, H. S. Gradle[8] has been using epinephrin for the relief of increased intra-ocular tension by topical application, with results that are just as effective as when the solution is injected underneath the conjunctiva. A small pledget of cotton is moistened with the same amount of epinephrin that would be used for subconjunctivial injection (from 4 minims to 0.5 c.c.), and with fine forceps is introduced well under the upper eyelid. The pledget remains in position two and a half minutes, and is then removed with forceps.

The systemic effects of the epinephrin become apparent in about six minutes after the procedure has been started, and disappear in about fifteen minutes. The lowering of the intra-ocular tension of the normal eye can be detected in about twelve minutes, and of the

(8) Jour. Amer. Med. Ass'n., Feb. 28, 1925.

pathologically high tension in a somewhat greater time. The mydriasis remains at the maximum for about 30 minutes, after which the pupil begins to contract, attaining the normal size and mobility in approximately one and a half hours.

The modus operandi of the decrease of ocular tension by epinephrin is as yet not perfectly understood; but, in all probability, it depends on the contraction of the vessels of the vast choroidal reservoir, thus actually decreasing the total content of the eyeball, as well as a freeing of the anterior chamber angle by a contraction of the vessels of the iris and an actual thinning in the anteroposterior diameter of the iris. Both these effects are due to a stimulation of the sympathetics by the epinephrin.

Mercurochrome in Ophthalmic Therapeutics. Mercurochrome is one of the dye antiseptics, and for this reason is disliked by many ophthalmic surgeons. But if one is careful in its application, staining of the outside surface of the lid may be prevented. Coating the skin surface with vaseline before application helps in this regard, or the stain may be removed by the use of 2 per cent. potassium permanganate solution followed by 5 per cent. oxalic acid solution as recommended by the manufacturers.

M. F. Weyman[9] found its use so satisfactory in a case of serpiginous ulcer of the cornea, three years ago, that he has used it almost continuously since then in various other affections. He uses a 2 per cent. solution of mercurochrome, made up fresh every week, and kept in an amber or blue bottle. Upon instilling a drop of this into the normal eye it is noted that there is no staining of either conjunctiva or cornea. Any mucus present will stain a deep red. Where the corneal epithelium is only so damaged as to stain slightly with fluorescin, and the deeper portions of the cornea are normal, there will be no staining with mercurochrome. But

(9) Calif. and Western Med., October, 1924.

if the epithelium is entirely denuded with the corneal substance exposed there will be a deeply stained area. Even though the epithelium be intact over an area of active deep infiltration of the substance the dye will penetrate and stain this affected area.

In the acute catarrhal conjunctivitis cases, particularly those where the pneumococcus is found, the discharge clears up most rapidly under the use of the ordinary silver nitrate solution followed by the mercurochrome, after the excess silver nitrate has been washed away with normal saline. It is well to get rid of the excess silver for a red precipitate is formed by mixing a mercurochrome and silver nitrate solution, as is also the case with sodium biborate, cocain, atropin, holocain, and zinc sulphate solutions. Boric acid solution gives no precipitate.

In corneal ulcer, if infected, the mercurochrome aids greatly in getting the ulcer clean and seems to stimulate the growth of epithelium as does scarlet red on skin ulcers.

In chronic dacryocystitis where there is a mucopurulent discharge from the sac it may be changed to a simple mucus discharge in a couple of days by the instillation of the mercurochrome solution.

The Practical Application of Protein Therapy in Ophthalmology. Since there is no longer any doubt that the positive systemic reaction to protein injection is a valuable therapeutic measure, it has become a matter of some debate as to the relative value of different *forms* of protein or different preparations of the same form. Also the problem of dosage and the timing of the injection in relation to other treatment offers a field for investigation which up to this time has not even been approached.

In respect to the former—that is, to the selection of the most suitable, highly potential protein available—antidiphtheritic serum, as it is now prepared, offers perhaps the best form of foreign protein for administration

to the human being. Because milk varies in its potential and toxic action, numerous commercial preparations are now undergoing experimentation. Normal horse serum, "aolan," "yatrencasein," "ciba" (cibalbumin, aseptic solution of egg albumen), albumose, proteose, nonspecific vaccines, and so forth, have not as yet been shown to possess with *any* certainty a more reactive and potential effect than that of antidiphtheritic serum.

As for anaphylaxis, a concentrated serum is not so likely to produce serum sickness as whole serum, since a smaller quantity of it is injected. The history of previous anaphylactic conditions, previous diptheria, status lymphaticus, asthma or hay-fever-like attacks in persons proved susceptible in a stable and horse environment, are well established as probable contraindications to serum injections. Ben Witt Key,[1] who has made an exhaustive study in this line of therapeutics, has not observed serious anaphylactic effects in any case (now 144 cases treated), and doses have varied from 1,000 to 5,000 units, with a total in one case of 12,000 units (given in 3,000 and 2,000 unit doses).

This author goes on to say that these doses are pitiably small when contrasted with those frequently given even for prophylactic purposes in diphtheria (5,000 to 10,000 units), not to mention those employed for the full therapeutic effect (10,000 to 20,000 units). Shall we discard morphin, quinin, the salicylates, and other dependable drugs because they possess toxic effects and because the rare case has an idiosyncrasy to them. Antidiphtheritic serum only justifies the same reasonable conclusion; that it is harmless in small doses, sufficient to produce a moderate systemic reaction just short of anaphylaxis.

The time of injection and the size of the dose have been given much consideration and have been referred to with some emphasis in previous reports. The matter of anaphylaxis is of importance in this regard because

(1) Atlantic Med. Jour., March, 1925.

sufficiently large doses are essential, just as they are in the treatment of diphtheria, in order to produce a suitable reaction and effect. This is necessary because the serum is almost immediately effective (ten minutes after injection, Rosenau), and this stage of pre-anaphylactic effect, representing the incubation period of disease, is the period of gradually increasing sensitivity of the body cells to the protein or disease element (bacteria) as a measure of body defense against the invader. The first stage of anaphylaxis is known to be one of exhilaration and stimulation, followed by one of depression, paresis, arrest of breathing, and the like. For this reason, it is the author's practice, after cauterizing an active ulcer of the cornea, to have the serum injected as soon as possible. For the same reason, we find an explanation for the constant observation that the effect of the serum is manifest always within 24 to 48 hours after injection, the time of hypersensitivity and cellular reaction. It is clear, therefore, that the time of the injection is important, as well as the size of the dose and the relation to local treatment.

In this connection, it is a matter of common knowledge among ophthalmologists of long clinical experience, that a case of hypopyon-keratitis in a strong, healthy, young individual is rarely seen; and when such cases are observed, local measures alone quickly yield the usual good results. The problem of cause and effect is obvious. The question of virulence of the infecting microorganism on the one hand and the defensive powers of the host on the other is evident. This has been brought very forcibly to mind in a series of experiments on rabbits, made in Eno Laboratory of the New York Eye and Ear Infirmary during the past several months. In an effort to secure a fixed virus of staphylococci (staphylococcus pyogenes aureus) by means of establishing the virulence of ocular selectivity, and then by suitable dilution of this virus, the author obtained that dilution which will produce by puncture of the corneal stroma

the slightest, but active, ulceration of the punctured area. (One colony of the 24-hour culture of staphylococci in 10 c.c. of boullion was cultivated for 24 hours, when .01 c.c. of the boullion was diluted in 300 c.c. of normal salt solution, thus making a dilution of 1 to 30,000.) By this more certain means of controlling the virulence and dosage of the infecting micro-organism, the matter of resistance becomes the more direct unknown quantity in the problem of cause and effect. It was found that the dilution must be remarkably great (1 to 30,000) in order thus to secure the *minimum* dosage of fixed virus that will produce the *slightest* active ulceration of the rabbit's cornea. The practical value of this is clear, because we are able thereby to study the relative value of different forms of protein as well as the dosage of the protein necessary to produce the therapeutic effect, and from this, one can more definitely measure the resistance of the animal to the inoculation. Furthermore, it makes one realize how minute must be, as a rule, the average quantity of micro-organisms first infecting the eye in a clinical case of hypopyon-keratitis or even in a penetrating wound, and therefore, if a highly potential protein *can* be injected before the infection has become overwhelming, a satisfactory result, which otherwise may have been a calamity, is deserving of our knowledge of these facts.

Having chosen that form of protein which we believe to be the most effective for our purpose, what are the indications in which we are justified in administering it? These may be enumerated as follows: ulcus serpens and hypopyon-keratitis, infection after penetration and panophthalmitis, idiopathic iritis and iridocyclitis (hidden focal infection?), keratomalacia and sympathetic ophthalmia, and for prophylactic purposes in certain cases. It has been employed, however, for disease of almost every anatomic element of the eye, also for the different infections to which the eye is exposed and without regard for the pathologic or bacteriologic diagnosis.

The character of the infection which seems most susceptible to protein effects is that resulting from invasion of the refracting media of the eye by the staphylococcus pyogenes aureus and the pneumococcus. Numerous authentic results have also been observed in idiopathic iritis (presumably from a hidden focus of infection).

As to the method of treatment: Intramuscular injection is much preferred to subcuticular, intravenous or oral administration, as variously advocated by different observers. Two to five thousand units (representing 2 to 6 c.c.) of antidiphtheritic serum, varying with the age and weight of the patient, is injected at the earliest possible moment, this dose being repeated or modified in 48 hours, depending on the reaction observed after the previous injection. A third and even fourth dose may be given, at 48-hour intervals, without fear of serious anaphylactic symptoms, if the previous dose has failed to produce a local and quite active systemic effect. Four c.c. (about 3,200 units) is the average dose employed and seems to be just as effective as larger doses.

Obviously protein injection should never be relied upon alone to combat an infection, since no claim is made for it as a germicide. In cases of penetrating wound with infection early observed, where hot fomentations and atropin are the only local means of value, and in cases of beginning ulcer of the cornea, in both of which classes of cases the threshold of resistance of the patient is made higher by protein injection, local treatment has proved to be unnecessary.

A local measure of value, the subtenon injection of warm hypertonic (2 per cent.) salt solution is given a few hours after injection of the serum, for the purpose of increasing the flow of lymph, increasing the permeability of the capillaries and stimulating leukocytic activity.

Up to this time Key has used protein injections in

144 cases (including 24 cases of ulcus serpens; hypopyon-keratitis, 68 cases; panophthalmitis, 16 cases; penetrating wound with infection, 30 cases—24 after accidental penetration, 6 postoperative; idiopathic iritis, 3; sympathetic ophthalmia, 2) most of which have been reported in detail. He has employed 32 rabbits in experimental observation of the protein reaction, some of which results have been published.

What are the clinical effects upon the organism to be observed after protein injection? These may be outlined as follows: first, the systemic reaction, and second, the focal or therapeutic effect.

The systemic reaction is expressed (depending on the character and amount of the agent injected and the sensitization of the particular individual to it) by a slight chill, rise in temperature, variations in pulse and blood pressure, sweating, nausea, nervous irritability, skin reaction, glandular activity, permeability of the capillaries, lymphagogue effect and certain variations in the blood—such as concentration, altered coagulability, leukocytic response, increased antiferment and alteration in the antibody-titer of the serum of the patient. The study of this reaction has grown out of nature's own method of resistance and repair, constantly demonstrated by the reaction from counter irritants, vaccines, enzymes, drugs, yeasts, colloidal metals, bacteria, and so forth. It is believed, therefore, that in a similar manner there is brought about in the body true tissue stimulation and activation, the therapeutic effect being produced by altering the reactivity of the whole organism, rather than by directly influencing the cause of the pathologic process.

The focal or therapeutic effect observed in cases of hypopyon-keratitis may be numerated as follows: In from 24 to 48 hours after the initial injection, the hypopyon is reduced or has disappeared; if not, a complication (as occurred in four cases, three of these syphilis and one unaccounted for) may be found to explain the

effect. Hypopyon may reappear with increased corneal and conjunctival reaction when injection of the serum is delayed or discontinued (as reported in detail in seven cases of a series of twenty-three cases), but almost invariably disappears promptly when injection of the serum is resumed (the same local treatment being administered). Besides the noticeable effect in hypopyon, there is relief of pain, rapidly subsiding conjunctival and iritic reaction and a clearing away of ulcer debris, such as does not usually occur in these cases, the ulcer itself taking on a clear and clean appearance early in the process of repair. The result of this prompt healing and clearing away of ulcer debris is found in the surprisingly mild opacities which remain, and in many instances the vision obtained is far beyond expectations.

The effects to be observed in cases of penetrating wound with infection are in every way similar to those occurring in cases of hypopyon-keratitis, the anterior segment clearing remarkably, and in some instances almost as rapidly as the infection had developed. In overwhelming infection and panophthalmitis, although no curative effect can be expected, there is often relief of pain, and the anterior segment gradually becomes clear, transparent and free of hypopyon. In idiopathic iritis, when the focus of infection cannot be found, antidiphtheritic serum has been employed with remarkable success. Key has used it in three cases only, but could not be sure whether the curative effects could be attributed to the protein or to other intensive measures employed. In ulcus serpens, before hypopyon develops, the results are quite uniform, and indicate the type of case particularly adapted for the administration of protein therapy. In these cases, in early cases of penetrating wound, and in most of the cases of hypopyon-keratitis, the therapeutic value of protein therapy is undoubtedly demonstrated.

Hemeralopia Lantern of Hess. The object of this simple and ingenious little apparatus, as described by Barkan,[2] is to establish:

1. The presence of night blindness.
2. To give an approximate degree of it, so that its progress in terms of a readily ascertained quantity can be clinically followed.

The interior of the metal box contains the illumination, in the form of an ordinary bulb attached without rheostat to any wall plug. This light illuminates seven small holes of equal diameter. Behind these holes are two glass slides which can be adjusted so as to overlap each other in various degrees. The one slide consists of an equally opaque white glass. The one shown in the illustration consists of a light gray glass at one end, becoming darker progressively toward the further end.

The patient is adapted in a dark room for twenty to thirty minutes and the lantern then lit. To the normal eye, with both slides completely overlapping, seven illuminated holes are seen; the first one opposite the least gray part of the slide seems the brightest, with the light of the seventh hole just to be discerned.

The hemeralopic patient, according to the amount of his deficiency, will not see all seven: he may see as few as one or as many as six. (Plate XV.)

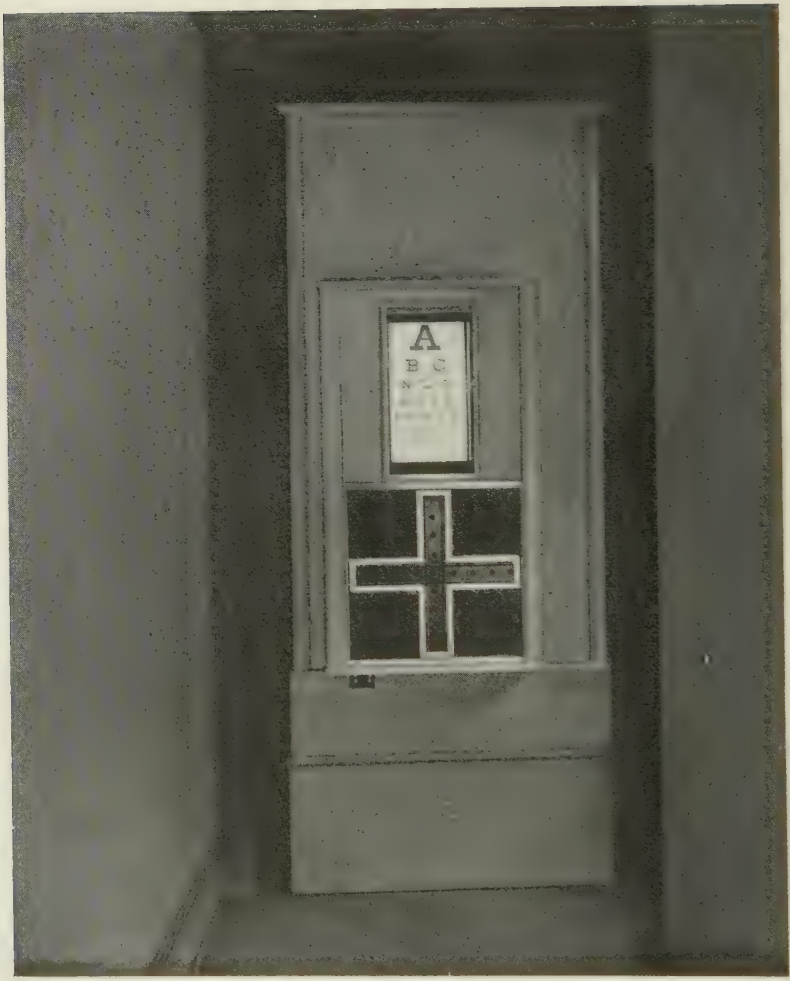
A Range for Refraction Embodying New Features. Sidelights, shadows, reflections, pictures, articles of furniture and irrelevant objects in general, all tend to divert the patient's attention during a refraction, and therefore prolong it, hasten retinal fatigue and lessen the accuracy of the result.

Plate XVI shows a refraction range, designed by S. L. Olsho,[3] in which these objectionable features, present in so many refracting rooms, have been overcome.

(2) Amer. Jour. Ophth., May, 1925.
(3) Ibid., January, 1925.

PLATE XV.

Lantern of Hess for testing hemeralopia.—Barkan, page 224.



A refraction range showing a continuous unbroken, neutral-gray vista, leading to test chart cabinet and muscle lights.—Olsho, page 224.

PLATE XVII.

A

B

A—The Prentice muscle device set in a weighted sash, automatically illuminated when raised to the level of the patient's eyes.

B—Method for obscuring all the light from a window by shades, yet permitting ventilation.—Oisho, page 224.

PLATE XVIII.

Color lantern of Hess.—Larkan, page 226.

To provide this particular range, the wall toward a distally adjoining room was opened from floor to ceiling for a width of five feet. The light from two windows was successfully obscured without seriously affecting the ventilation. These windows were framed and curtained in a special practical manner, illustrated in Plate XVII, *B*. A side wall of sheet rock was constructed with a flush-fitting door near the distal end and a curtained doorway for the entrance of patients, near the proximal end. The room measures 5 by 24 feet.

The test chart cabinet, the ceiling and walls are all a neutral flat gray. The linoleum floor is painted with a gray floor paint of the same shade. Test case stand and all the indispensable furniture are enameled gray. The object is to provide a continuous, unbroken, neutral-gray vista, leading to the objective, *viz.:* the Test Chart Cabinet and Muscle Lights.

The patient is seated in an operating chair, elevated sufficiently in this instance so that the examiner may stand to refract. The Test Chart Cabinet has been correspondingly elevated.

The cabinet for the test charts embodies a number of important new features referrable to the illumination, the muscle tests and a screening device.

The charts are set far back in the cabinet and are illuminated by two pairs of 50 Watt "Mazda C" "Daylight Lamps," controlled by a rheostat. Each pair is in a vertically placed W. & O. metallic reflector, covered by ground glass to diffuse the light. The reflectors extend the length of the test chart, one on each side, and are concealed from view in the cabinet. Each reflector is attached to a fixed vertical supporting rod, which acts also as a center of rotation so that the reflector may be made to face the chart at any desired angle. The reflectors are placed well to one side much farther from the charts than has been customary heretofore. The object is to illuminate the chart from an angle suffi-

ciently oblique that the great volume of incident rays of light will shunt off laterally inside the cabinet rather than be reflected at an angle of 90 degrees directly toward the eyes of the patient.

There is a sliding panel on the cabinet which may be lowered directly in front of the test charts. This panel has a small, adjustable, circular perforation which as the panel descends, is automatically illuminated by an independent lamp. This brings a single muscle test light on a level with the patient's eyes.

Plate XVII, *A*. "Closeup" of Plate XVI shows the Prentice Muscle Device set in a weighted sash, raised to the level of the patient's eyes, whereupon it becomes illuminated.

Plate XVII, *B* shows a method for this or any other purpose, of effectively obscuring all the light from a window by shades, yet permitting ventilation.

"F" is a wood frame, 6 inches wide, ½ inch in thickness, resting on the sill, exactly fitting the inner window opening, secured in place by four small slide-bolts and easily removable.

The window shade already present is not disturbed. An additional shade as wide as possible is attached to the accessory wood frame backed up close against it. With both shades drawn no light leaks through.

Color Lantern of Hess. This apparatus serves to establish with rapidity anomalies of red and green vision (anomalous trichomates), and red-green blindness. As described by Barkan[4] the box contains a frosted globe and is attached directly to the ordinary light socket. In the slots are four colored glasses—red, green, yellow and blue. Anterior to these in the box is a small mirror which tilts so as to throw various combinations of red and green, yellow or blue, or any mixture of the four through the glazed small, circular ring in the center of the paper placed in the holder in front of the box.

(4) Amer. Jour. Ophth., May, 1925.

The mirror is tilted by means of the small lever above the box. (Plate XVIII.)

The colored glasses are placed in the slots so that the tilting of the mirror in one extreme position will cause the green light only to be reflected forward and the patient looking through the fixation ring in the front of the box sees a green illuminated ring in the paper; tilting the mirror in the opposite direction causes this green ring to change slowly to red. The patient is asked to state when the ring first shown to him—whether it be red or green—looks different. The lever is then moved and the ring changes slowly from green or red to the opposite color. The examiner notes the moment when to him the ring is not pure green, but begins to contain a shade of rose; or if red originally, to contain a shade of green. If the patient calls this shade late, or not at all (if he is totally red or green color blind, he will not state that there has been any change to him from the beginning to the end of the movement of the lever) one can mark him down as totally or relatively color blind.

For anomalies of red and green differentiation, the red glass and gray is put in the upper slots, the blue and the yellow in the lower. The lever is set so that the glazed ring is without any color for the normal eye. This needs a little finer adjustment of the lever and colored glasses, as well as sometimes a slight movement up or down at the posterior end of the apparatus of the source of illumination. The apparatus can also be turned so as to face the daylight or faced away from it until the glazed ring is without color. If the patient sees this ring colorless, he is normal; red or reddish, he is a deuteranope; green or greenish, a protanope.

This apparatus serves very satisfactorily in the detection of color blindness. It has two distinct advantages:

1. The patient does not have to name the colors. He is told to state when the color rings look different to him and if he does not do so he is red or green color

blind. This can be estimated in three or four seconds.

2. In the examination of school children, or in the tests made for railroad employees or for the Army or Navy, and so forth, it would be of the greatest advantage. The tests can be made rapidly—20 to 30 seconds per person.

Red Toric Lens with Handle for Studying Diplopia. The diplopia disk described by Conrad Berens[5] was made as the result of two experiences. It was found that patients with nervous diseases, and elderly people, could not hold a small red glass steadily before their eyes, and that the red lens placed in the trial frame did not permit a sufficiently wide field of binocular fixation.

It was found that diplopia resulted from the prismatic effect obtained from the edge of the pressed glass in diplopia spectacles.

This apparatus consists of a plane, monochromatic, red, toric, ground lens with a nine diopter base curve, mounted in a metal rim and supplied with a ring-tipped hexagonal handle. The curve of the lens permits its use over the patient's lenses. (Fig. 49.)

Fig. 49.—Lens with handle for studying diplopia.

It is employed in detecting diplopia and mapping out diplopia fields and in conjunction with the tangent screen in the extinction test for mapping scotomata and the blind spot. The glass is held before the eye not under examination, both eyes fixing the point of fixation and a colored test object, usually blue, is moved in the blind spot or the area of the suspected scotoma.

Suction Instrument for Extraction of Cataract. In-

(5) Amer. Jour. Ophth., June, 1925.

struments for sucking out softened lens substance following discission, or fragments left after cataract extraction, have been in use for many years. The instruments have generally had a metal tip cemented on a glass barrel, making it difficult to clean. F. W. Dean[6] has recently devised one with a silver barrel, which can be easily boiled and cleaned. (Fig. 50.)

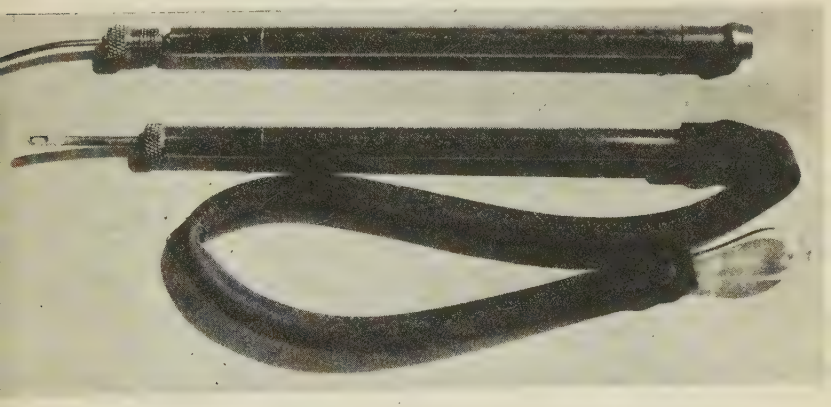


Fig. 50.—Suction instrument for extraction of softened lens matter, (three-quarters size).

The operation is simple. The glass mouth piece is held between the teeth and the lips. The tip of the instrument is passed through a small opening at the limbus of the cornea. The opening in the tip is brought under and in contact with the lens substance to be removed. A slight movement of the tongue draws the lens fragment into the barrel. The tip is moved from one particle of lens substance to another until all has been removed. This is done with one introduction of the tip. The operation is so simple and satisfactory that the author prefers to remove the lens substance on the third or fourth day following the discission rather than wait for the lens to be absorbed. It should be borne in mind that if one

(6) Amer. Jour. Ophth., June, 1925.

desires to draw out the lens early he must incise it thoroughly in order to give the aqueous free contact with the lens tissues.

Cataract Eye Speculum. A speculum has been designed by G. H. Bell,[7] to lay over the nose with the hinge or joint over the nonoperated eye, leaving the temporal region, on the side of the operation, entirely free from parts that might in any way limit the operator's freedom or come into accidental contact with the cataract knife or other sharp instruments.

Special attention is directed to the distinctive form of the lower arm of the speculum, which is bent sharply upward, and returns, crossing the straight upper arm in the median line (anatomically speaking). The object of this bend is to have the two arms of the speculum cross the nose at the same level; otherwise the speculum is tilted out at the bottom and dislodged. The speculum is easily inserted and firmly retained, regardless of the size or shape of the nose. (Fig. 51.)

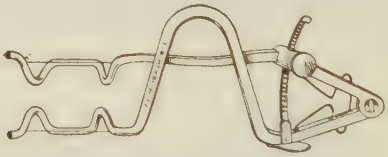


Fig. 51.—Cataract eye speculum.

The speculum was devised particularly for cataract operations to give the operator perfect freedom of movement of his fingers at all times, which greatly facilitates the making of a perfect cataract section; but it may be used in place of the ordinary speculum for all purposes. A separate speculum is required for the right and left eye.

(7) Jour. Amer. Med. Ass'n., July 25, 1925.

The Ear

ALBERT H. ANDREWS, M.D.

THE EAR

Hearing Tests

Functional Tests of Hearing. For many years otologists have recognized the inadequacy of the commonly employed tests of auditory function. During the past five years there has been distinct progress along this line owing to the work of certain otologists and physicists, in co-operation. According to I. H. Jones and V. O. Knudsen[1] the utilization of the audion bulb is largely responsible for these new developments. It occurred to these authors that in addition to the production of tones the following features could be utilized in making functional tests of hearing:

1. The use of the other feature of the audion bulb—as an amplifier, for the conversational voice and whisper.
2. Selective amplification in testing with the conversational voice.
3. The use of the amplified voice, directed at will to one ear or the other, in testing for malingering.
4. A device for quantitative tests of bone-conduction.
5. The use of convenient form of noise apparatus.
6. A double use of the same audion bulbs, whereby these bulbs could be used either as an amplifier or as an oscillator.
7. If possible, the uniting of all these features in one instrument.

Accordingly the authors have developed an audio-

(1) Laryngoscope, September, 1924.

amplifier instrument. The four principal features of the apparatus are: a speech amplifier, an audiometer, a special receiver for measuring bone conduction, and a noise apparatus.

When the key K_1 is closed in one direction the instrument is a speech amplifier. The speech amplifier is similar to amplifiers employed in telephone and radio practice. The speech enters a transmitter (T) and is then amplified by the two stage vacuum tube amplifier. In the output of the amplifier, between the second tube and the telephone receiver, is a volume control. This consists of a combination of series and parallel resistances. By means of a dial associated with the volume control the volume of the speech in the receiver can be regulated to give all graduations of loudness from inaudibility to speech of great loudness.

Between the two stages of the amplifier is a correction circuit. This consists of an inductance L, a resistance R, and a capacitance C. These are arranged so that when the key K_2 is in its neutral position the correction circuit is not connected in the amplifier circuit and therefore tones of all pitch are amplified equally. When the key K_2 is closed in one direction the capacitance C and the resistance R are connected across the input of the second tube. This provides "low pass amplification," that is, the tones of low pitch pass at full amplification and the tones of high pitch pass with only slight amplification. In contrast, when the key K_2 is closed in the opposite direction, the inductance L and the capacitance C are connected across the input of the second tube. This provides "high pass amplification," that is, the tones of high pitch pass at full amplification and the tones of low pitch pass with a lesser amplification.

By closing the key K_1 in the opposite direction the instrument is converted from a speech amplifier to an audiometer. The audiometer portion of the audio-amplifier does not differ essentially from the Western

Electric Company's audiometer. When the instrument is changed into an audiometer the same two vacuum tubes which are employed for the speech-amplifier are utilized for the audiometer. The first tube, with its associated resonant circuit, becomes an oscillator. The second tube continues to function as an amplifier. By these means it is possible to produce tones of low, medium, or high pitch and of any loudness from the minimal threshold to tones which are very loud. The loudness of the tones is controlled by the same volume control which was used to control the loudness of speech in the amplifier described above.

The instrument which the authors have been using for testing patients during the past eight months will produce tones of the following frequences: 64 d. v., 128 d. v., 256 d. v., 512 d. v., 1024 d. v., 2,048 d. v., 4,096 d. v., 8,192 d. v., and tones of every gradation of pitch above 7,000 d. v., up to and beyond the upper limit of audibility. There is also a fine adjustment for the pitch control which provides a means for producing small differences of pitch. This is useful in testing for diplacusis and sensibility to small differences of pitch.

The patient is first tested with the amplified conversational voice. A radio head set is adjusted to the patient's head so that a receiver is held to each ear. By means of the key K_6 the speech is directed to either ear. The examiner then speaks a few words into the transmitter, in a low tone of voice and with the patient so placed that he cannot see the examiner; first with "uniform amplification," then with "low pass amplification" and then with "high pass amplification." The patient is then asked what kind of amplification produces the best and most natural quality of speech. The loudness is then adjusted by means of the volume control until the speech is heard best by the patient. If the patient has obstructive deafness he will hear best with uniform amplification, if he has fixation deafness he will hear best with low pass amplification, if he has

nerve deafness, which has not progressed too far, he probably will hear best with high pass amplification. If the nerve deafness is pronounced the speech will be confused and will sound unpleasant to the patient no matter what kind of amplification is produced.

Having found the kind of amplification best suited to the patient, the examiner uses the whispered voice and reduces the loudness until the patient can no longer make out what the examiner is saying. The position of the dial associated with the volume control is noted, and by comparing this with a chart of calibrations the percentage of deafness is read off directly. In many instances no further tests will be necessary. The nature and approximately the percentage of the hearing defect have been determined, and the test has required only a few minutes or two for its completion.

In many instances, however, it is desirable to obtain more confirmatory, precise and complete measurements. These include quantitative measurements of bone conduction and precise measurements with the audiometer. Bone conduction measurements are made with a tone of 256 d. v., using the distal end of the aluminum rod.

It is the belief of the writers' that the audio-amplifier, and other instruments for measuring the auditory acuity, will serve their greatest usefulness in discriminating between correctable and incorrectable types of deafness, and in prescribing artificial aids to hearing which are designed to correct the particular defects of each individual case. The selective amplifier portion of the audio-amplifier is particularly useful for this purpose, because the patient at once realizes at the time of examination what help he can derive from a uniform, a low pass or a high pass amplification. The writers have been working on the designs of portable selective amplifiers for correcting hearing defects. These amplifiers are constructed according to the prescription given by measurements of the auditory acuity. Three such amplifiers, or "magnaphones," have been constructed

for three different women, and have given good results. These "magnaphones" are made up of a transmitter, a two-stage amplifier, a correction circuit and a telephone receiver. They are encased in leather vanity cases, seven inches long, six inches high and three and a half inches in thickness.

Observations in Bone Conduction and a Differential Test for Stapes Fixation. E. R. Lewis[2] believes that it is possible to differentiate between fixation of the stapes footplate and conduction-obstruction of other nature.

The vibrating fork held on the root of the zygoma—just at the glenoid—is heard normally almost as loud and as long as it is when placed over the auditus-antrum area of the mastoid. When it is held on the tragus it is heard normally louder and longer than when it is on the zygoma-root. When the canal or tympanic cavity is the site of a simple obstructive lesion, the same relation continues to exist—namely, the fork is heard louder and longer on the tragus than on the zygoma-root. Cases of nerve-deafness also show this same relation between the hearing on the zygoma-root and the tragus—namely, the fork is heard louder and longer on the tragus than on the zygoma-root. When this test is made on cases of known fixation of the footplate of the stapes, this relation is reversed. The fork on the zygoma-root is heard long after it ceases to be heard on the tragus; while it *is* heard on the tragus, it is heard much louder on the zygoma-root.

This differentiation seems consistent with accepted conceptions of the physics of the hearing apparatus. With the fork on the bone, the vibrations are transmitted directly by bone in all directions; when the perilymph of the scala is encountered by the vibrations they are transmitted *normally* by the perilymph in such a manner as to effect interaction between the hairs of Corti and the tectorial membrane. With both round window and oval window closed, conceiving the mem-

(2) Laryngoscope, February, 1925.

branous labyrinth as completely surrounded by unyielding tissue, transmission of vibrations in such a manner as to result in interaction of hairs and tectorial membrane would be theoretically impossible; but as long as either or both windows are not so closed, the contained fluid finds a venting which permits the production of the interaction necessary to stimulation of Corti's cells.

In case of fixation of the stapes footplate, sound-waves conducted directly via the bone have no difficulty in stimulating Corti's cells, because of the venting at the round window; but sound-waves from the tragus produce almost no stimulation of Corti's cells, owing to the peculiar conditions encountered in the conduction mechanism of the tympanum. They might find access through the internal membrana tympani, but as the same membrane must act as the vent for the waves passing through it to the perilymph, its efficiency in acting thus as a transmitter is greatly lowered. This results in the marked inferiority of the tragus route as compared with the bone route for vibrations in these cases.

The test is very quickly carried out, using either a vibrating fork between 96 and 256 d.v. or the audiometer with bone-conduction sound-piece.

A New Form of Galton Whistle. The new form of Galton whistle has been developed as a "single-handed" instrument, in that the left hand holds the whistle and adjusts the pitch, while the right works the bellows during the entire period of observation. K. L. Schaefer[3] supplies a detailed description of the instrument, supplemented by an illustration. The author points out that the Galton whistle must not be started with a short current of air, *i.e.* not with the small rubber ball hitherto employed, but that a continuous air current must be used; this is furnished by double rubber bellows which completely replaces a larger compressed air instrument.

(3) Beitr., z. Anat., Physiol., Path. u. Therap. d. Ohres, etc., November, 1924.

The writer discusses the manipulation and the effect of the double bellows and passes to the hearing test, which is performed as follows: At the start, the whistle is adjusted to a pitch known to be higher than the expected limit of hearing; it is then brought into the vicinity of the ear to be tested, so that the mouth of the whistle is directly in front of the auditory meatus and the scale can be easily read. The blowing is then started, and while it is continued without interruption the whistle is gradually drawn out until the patient indicates the first perception of sound. The length of the whistle shown by the scale is then recorded. The process is repeated, starting with a sound just definitely audible, and noting the length of the whistle at which the tone barely becomes imperceptible. The mean of the two determinations is the desired value. The corresponding wave length, pitch, and number of vibrations can be calculated from a scale which accompanies each whistle. This new form of Galton whistle permits the aurist to carry out conveniently and rapidly sufficiently accurate determinations of the upper limit of hearing.

The Present Status of Vestibular Tests in Intracranial Conditions. In order to determine the merits or demerits of vestibular examination, the records at the University Hospital were examined for several years back, and those cases selected which were definitely verified either by operation or autopsy. The findings in 103 cases are analyzed by L. F. Fisher:[4]

1. Cerebellopontileangle tumors, 29 cases.
   (a) Vestibular examination correct in 27 cases.
   (b) Vestibular examination incorrect in two cases.
   Vestibular examination made diagnosis in four cases.
2. Tumors of Fourth Ventricle, three cases.
   Vestibular examination confirmed in three cases.
3. Midline Infratentorial tumors, two cases.
   Vestibular examination confirmed in two cases.
4. Cerebellar Lesions, 28 cases.
   (a) Vestibular examination correct in 21 cases.
   (b) Vestibular examination incorrect in five cases.

(4) Laryngoscope, September, 1925.

(c) Cerebellum ruled out by vestibular examination, in two cases.

5. Cerebral Lesions, 28 cases.
   (a) Hemispheric lesions.
      (1) Vestibular examination correct as to side of lesion fifteen cases.
      (2) Vestibular examination ruled out posterior fossa lesion in ten cases.
      (3) In three of these cases, vestibular examination alone, made diagnosis.
   (b) Pituitary Lesions, thirteen cases.
      (1) Vestibular examination correct as to location in ten cases.
      (2) Vestibular examination ruled out posterior fossa lesion in two cases.
      (3) Vestibular examination incorrect in one case.

The author describes six illustrative cases in detail, and summarizes the vestibular values as follows:

In the group of cerebellopontileangle cases the first symptoms are frequently aural and the otolaryngologist is the first doctor consulted. The phenomenon-complex of a totally destroyed ear on one side, with nonresponsive vertical semicircular canals on the side opposite the lesion, and good responses from the horizontal canal on that side, was found to be very reliable. There were quite a few variations from the typical picture, such as, eight cases with retained hearing on the side of lesion, seven retained function of the vertical semicircular canals of the opposite side; but if one adheared to the principle that a case of this type must show unmistakable neuro-otologic evidence of a central lesion, then the diagnosis can be made with certainty. In angle lesions, the findings obtained in an ear examination are more positive and more reliable than the findings obtained in any other type of examination, but only in this type of case should the otologist maintain his ground even when his opinion does not coincide with the neurologic one. Since cerebellopontileangle lesions are fairly frequent the neuro-otologic examination, even if it does nothing else, serves quite a role in intracranial diagnosis.

Vertigo and past-pointing were found to be reliable

indications of the condition of posterior fossa contents. A cerebellar lesion, with very few exceptions, should show impaired vertigo and past-pointing. However, the presence of good vertigo and past-pointing is even more strongly indicative of a normal cerebellum. Another feature of cerebellar lesions is the lack of susceptibility of those patients to vestibular stimulation. Nausea, pallor, sweating and vomiting, as a result of douching and turning, were practically never encountered in cases of cerebellar disease and its presence was used almost as a definite indication that the lesion, if present, is not cerebellar.

No definite phenomenon-complex has been noted for cerebral lesions. Spontaneous, vertical nystagmus may or may not be present; the vertical semicircular canals may or may not respond, the after-turning nystagmus may be shortened or lengthened or be normal, but it has been noted, that cases with cerebral neoplasm can tolerate but very little vestibular stimulation before nausea or vomiting appear. Frequently, neurologic cases require the differentiation as to whether the lesion is supra- or subtentorial. The susceptibility or non-susceptibility of the case to ear stimulation can frequently determine that point in a way that no other type of examination can. Thus, given a patient with unmistakable neuro-otologic signs of a brain lesion, who is easily made sick by turning or douching, the case is cerebral. If, on the other hand, large doses of ear stimulation do not upset the patient, the lesion is cerebellar. The presence of a conjugate deviation of the eyes, following stimulation, instead of a full nystagmus is a fairly accurate indication of the side on which the lesion is located.

Testing Malingering of Deafness. D. Macfarlane[5] feels that in these cases the general attitude of the examiner should be sympathetic and friendly, rather than domineering and overbearing. The object is not to

(5) Atlantic Med. Jour., November, 1924.

make the patient report against his will but to lead him to betray himself unwittingly. There should be no dispute with the patient about what he reports but a mere recording of the findings.

The author enumerates the various tests to be employed, describing the use and application of each: (1) In the tuning fork tests, and their timing a stop watch is essential, and three separate tests should be made and the results compared. (2) Teal's test: air and bone conduction are taken with the patient blindfolded. The final part of this stest is to place a nonvibrating fork or a pencil against the mastoid while a vibrating fork is held at the meatus. (3) Keiper's voice test: with the patient blindfolded, the usual voice testing is done, varying the distances at which words are spoken. (4) Bárány's noise apparatus: this alarm clock makes a rattle that drowns out hearing and if the patient is asked to read aloud while the noise is going he will begin to shout in order to hear himself. (5) Confusion tests: with two speaking tubes, one to each ear, two people read dissimilar matter at the same time and, if the patient has two hearing ears, he will be unable to recount what has been read to him. (6) Stethoscope test: with the instrument attached to the patient's ears, the examiner standing behind him speaks into the bell and can control the passage of sound to either ear by pinching the tubes. (7) Plugged stethoscope test: one tube may be plugged with wax preliminary to the testing. (8) Galton whistle test: with a whistle of low calibration, the patient should hear the sound "around the head" and in the good ear when the whistle is put to the deaf ear, whereas he will be tempted to report no hearing. (9) Erhard's test: the normal ear will hear the spoken voice at a few feet distance even when stopped with a plug, so if the patient says he cannot hear under such circumstances he is malingering. (10) Stenger's test: with patient blindfolded, two identical forks are used, say C-256, and when the sound of the

one before the good ear is dying out, if the other fork be struck and held before the allegedly deaf ear it will drown out the sound of the first one if it is heard in the "deaf" ear.

Simulated bilateral deafness is rarely encountered, unless the patient has had some degree of real deafness and the simulation is then as to the amount of hearing remaining.

[Most cases of malingering have a legal aspect so it is advisable to employ more than one test and keep careful records of results. An excellent noise apparatus is a large low toned tuning fork pressed against the tragus of the admittedly hearing ear.—Ed.]

The External Ear

Painful Nodular Growth of the Ear. O. H. Foerster[6] reports eight cases, which, with four reported by him in 1918, bring the recorded cases up to twenty-one. The patients were men, aged 27 to 68, with painful, single nodules on the helix varying in size from 3.5 to 5 mm., and of 2 months' to 12 years' duration. The nodules appeared suddenly, reached maximum size in a few weeks and then remained practically unaltered except for secondary inflammatory changes. They were single, ovoid or circular, well defined and firm, embedded in the skin or elevated several millimeters above the surface, mostly immovable and firmly attached to the cartilage, flat-topped or convex with sloping sides, and often showing a deep or shallow central depression filled in with adherent crustlike scale.

The condition is an entity, whose clinical and histologic characteristics differentiate it from epithelioma, keratosis or other conditions which may resemble it. The etiology is unknown but the anatomic peculiarities of the part of the ear almost exclusively affected lend support to Winkler's foreign body theory. Excision,

(6) Arch. Dermat. and Syphilol., February, 1925.

including the cartilage, is probably the best treatment, but it must include the entire lesion or recurrence follows. Excisions made twelve and five years ago have not shown recurrence. In one case the nodule disappeared spontaneously without treatment, in one recurrence took place eight weeks after a radium application sufficient to produce inflammatory reaction. Roentgen ray treatment was given in eight cases, in three of which the lesions disappeared after a maximum of four suberythema applications, with no recurrence after three years; in one case the lesion was not influenced, in two it disappeared and recurred in two months, and in one it nearly disappeared, recurring one year later. In all eight patients roentgen treatment gave pronounced relief from pain after the first dose. Fulguration and galvanocautery are suggested when excision is refused or radiotherapy has failed.

A New Apparatus for Photographing the Tympanic Membrane and Larynx. This apparatus reported by Hegener[7] is attached to a stand which is so constructed that the examiner may face the patient as in ordinary endoscopy. A long bracket is adaptable to the patient's height. A stereoscopic camera carries the whole illuminating system, which lights the field brightly and in the exact center. Camera and illuminating system are movable like a gun on its carriage and adjustable for focusing. The focusing adjustment may be operated either by a handle or by a mouthpiece held between the observer's teeth, when the release is effected by the lower lip. Thus both hands are left free to move the patient's head. Until the moment of release the picture of the tympanic membrane and larynx is seen plastic and enlarged in a vertical position. For photographing with color plates an antrochrome filter may be interposed. In a suitable stereoscope the tympanic membrane is seen twice and the larynx one and one-half times the natural size. The known exact enlargement and known focal

(7) Ztschr. f. Hals—, Nasen—, u. Ohrenhlk., Nov. 8, 1924.

distance permit accurate measurements in all axes on the picture.

Furuncles of the Auditory Canal. In the treatment of furuncles in the auditory canal J. F. O'Malley[8] favors the use of pure carbolic acid. In all cases, to begin with, 3 gr. of calomel should be given at night followed by a saline in the morning. If the patient is seen very early, before inflammatory infiltration is pronounced, touching the point of infection with pure carbolic may cause the furuncle to abort, but care must be taken to prevent the carbolic flowing beyond the exact spot, otherwise an area of skin may be denuded of epithelium and a further infection result. If the exact point cannot be discovered, carbolic oil should be applied with a piece of wool to the entire meatus twice daily. It serves two purposes, the first being to render practically inactive any organism present in the meatus at the time, and the second to act similarly on any fresh organisms entering from without or from pus escaping when the furuncle matures. In mild cases it is ample treatment and prevents the tendency to recurrences. Excessive moisture in the meatus leads to maceration of the epithelium, and as this facilitates reinfection the amount of liquid left behind should be reduced to a minimum, whether it be oil, lotion, or drops. When there is much inflammatory induration present, accompanied by pain, fomentations give considerable relief, and if persisted in for 24 hours will often suffice to bring the furuncle to maturity and spontaneous rupture. It is a moot point whether fomentations favor the occurrence of furuncular crops or not. If too moist they may do so by macerating the epithelium, but probably not otherwise. If carbolic oil has been previously used it should be cleaned off the skin as carefully as possible or the application of heat over it may result in a blister. The fomentation by itself will produce a blister if too hot, and is then probably responsible for

(8) Lancet, July 18, 1925.

reinfection and some discredit to an excellent method of treatment. Dry sterile wool in the meatus, concha, and around the pinna, over which a rubber hot water bottle is applied, is very comforting.

[In furunculosis silk or cotton rubber elastic buckled singly around the neck and worn continuously during the acute attack seems to give relief and lessens the tendency to recurrence.—Ed.]

Fractures of the Malleus. In this article D. W. Drury[9] reviews the 44 cases reported in the literature and adds a case coming under his own observation. The injuries to the drum are grouped as follows: (1) twigs entering the canal, (2) foreign bodies, (3) pen holders and hair pins, (4) falls, and (5) blows. In the author's case the patient tripped while hunting in the woods, a small branch brushing the right ear. This immediately caused excruciating pain in the ear, and explosive like noise in the head, associated with nausea, and later vomiting. Aural examination showed no sign of injury to the external ear but clotted blood was found in the canal. The drum membrane was injected in the superior portion, while in the inferior part was an open perforation, which showed a separated piece of the malleus at its lower edge, just above the umbo.

The treatment consisted of absolute rest in bed, liquid diet, catharsis, elevation of the head to about 45°, the instillation of 10 per cent. argyrol into each nostril several times daily, and the caution not to blow the nose for the first 24 hours. The canal was wiped out with 70 per cent. alcohol, dried with sterile gauze, a small amount of boric powder blown into the canal and a sterile wick, together with a sterile pad and bandage to the head. Convalescence was quite uneventful, the drum healing in two days without suppuration. The nausea and vomiting did not bother following the patient's return home, but the tinnitus lasted for several months gradually growing intermittent and finally

(9) Laryngoscope, May, 1925.

ceasing altogether. Three months after the injury it did not seem that union of the malleus was particularly firm although a callus was noticeable just above the umbo. Six months after the accident, the union was firm, but there was an appreciable obtuse angle between the united ends of the handle. The hearing had returned to about what it was previous to the accident, the eustachian tube was patent and there was no apparent adhesion of the drum membrane to the promontory.

Generally the prognosis in these cases is very favorable indeed unless there are complications such as a fractured skull. As to the treatment, however, the least the case is disturbed the better the result will be. It is impossible to bring the fragments into apposition and to hold them in place. Consequently a small amount of dry powder insufflated into the canal, together with dry wicks, or no wicks at all, seem to be the best treatment. If the middle ear becomes infected dry wipes without the use of powder is the advisable procedure. Should the discharge become pus, then it would be necessary to syringe the canal carefully, followed by complete drying and dry wicks placed in the canal. Generally, however, the convalescence is quite uneventful.

The Middle Ear

Chemotherapy in Otitis Media. E. M. Schwartz[1] states that the streptococcus and staphylococcus are the most prevalent organisms in pure cultures from ear discharges. Other organisms found are the gram positive pneumococcus, diphtheria bacillus and tubercle bacillus, and the gram negative bacillus pyocyaneus and influenza bacillus.

The method of irrigating ears with bichlorid solution, boric acid, normal saline, sodium bicarbonate or weak lysol solution has been employed with more or less success. The duration of otitis media where these

(1) Ann. Otol., Rhinol., and Laryngol., September, 1925.

methods are employed has varied considerably from weeks to months, many cases of acute otitis media becoming chronic, the discharging persisting for years and complicated by a foul odor.

David Smith of Johns Hopkins Hospital and Rockefeller Institute and Justina H. Hill, bacteriologist, have recently made numerous tests of the bactericidal action of several synthetic drugs and dyes. The cultures used were made from purulent otitis media cases. The drugs employed were: acid fuchsin, meroxyl, neutral acriflavin, gentian violet, mercuric chlorid, mercurochrome.

It was found that meroxyl or sodium hydroxy-mercuri-benzophenone sulphonate acts mainly on gram negative organisms and that gentian violet acts on gram positive organisms, and it was also found that these drugs could not be mixed, because gentian violet was precipitated by the mercury of the meroxyl. The pyocyaneus resisted both of these drugs. Acetic acid was then employed with remarkable results. It worked almost like a specific in pyocyaneus cases, and it was also found that acetic acid could be combined with the sodium solution. Churchman has shown that neutral acriflavin and gentian violet may be mixed and that the mixture is more bactericidal for streptococci than gentian violet alone.

The method employed in the application of these dyes is mostly mechanical. A free incision in the drum or tympanum is very essential, so that the drugs can act directly on the middle ear or mucous membrane of the eustachian tube, and thus work on the organisms causing the otitis media. In order to obtain a clear field, some irrigation is first necessary. Hydrogen peroxid half strength is employed. The oxygen liberated loosens the pus and serves as an indicator of the presence of free pus. By the aid of a medicine dropper the ear is flushed several times, or until the peroxid stops frothing. Then the fluid is sucked out until the ear is dry. Objection has been raised to the use of peroxid on

the ground that the oxygen liberated in the middle ear may force organisms into the mastoid, but the author believes this to be groundless.

At first a culture and smear were taken from the pus in the ear to determine whether the organisms were gram positive or negative. After irrigation with hydrogen peroxid, the ear having been dried, the sodium solution or violet was dropped into the ear, depending on whether the gram positive or negative organisms predominated.

In order to simplify the method, so as to avoid the necessity of making smears and culturing the ear discharge, which is sometimes found impracticable, the author decided upon the following changes, so that he could proceed without determining the type of organism or organisms present by culture or smear: After the external auditory canal and middle ear are thoroughly cleaned with the peroxid, a half medicine dropper of the meroxyl and acetic acid solution is introduced into the external auditory canal. This solution is washed back and forth, in order to force the solution into the middle ear, so that it may act directly on the organisms. Thus the drug acting on the gram negative organisms and the drug acting on the pyocyaneus have been employed. The ear is again dried by suction and by means of cotton applicators. A few drops of the gentian violet and neutral acriflavin combination are then instilled into the ear and a piece of cotton placed in the external auditory canal to prevent overflow. This is left undisturbed until the next treatment.

The results obtained from this method of chemotherapy have been very good; especially remarkable were the cures obtained in chronic otitis media of months' standing, with a foul odor and a thick pussy discharge —such cases as have been lying on the hands of the otologist for so long a time as to discourage both him and the patient. After two or three treatments the first thing that the patient notices is the disappearance

of the offensive odor, with a gradual diminution of the discharge and drying up of the ear. Of special interest to the patient is the order to diminish the frequency and soon to stop all ear irrigations. The patient has absolutely nothing to do but wait and report for the next treatment. A point to be emphasized is the importance of a free and wide opening in the drum in order to permit the drugs or dyes to act directly on the organisms in the middle ear. If the ear is watched closely, the meroxyl being somewhat irritating, one can notice as the pus diminishes a slight redness around the edges of the drum opening and evidences of new granulations which gradually fill in the gap and seal the drum.

In the acute cases the results are also good. After one or two treatments the pain and temperature are lowered in many cases, and the patient feels much more comfortable.

The advantages of this treatment can readily be noticed. First of all, the ease of application. The doing away with irrigation is the one thing which appeals to the parents most. It does away with the spilling of the solution, the resistance and fight offered by the child, and it gives the patient an opportunity to rest. The more certainty of the method, the greater number of cures and the shortening of the period of the disease are matters which cannot be overlooked. There is also a less tendency to mastoid involvement.

Just as there are advantages in every method employed, there are also disadvantages. One disadvantage noticed is the staining produced by the gentian violet. Should it stain the face or hands it can readily be washed with alcohol, as gentian violet is soluble in alcohol. Again, the staining of the drum may interfere with the field under observation and somewhat change the contour of the drum. Where one has had considerable experience in looking into ears and recognizing pathology this objection is readily overcome.

The neutral acriflavin, gentian violet, mercurochrome, brilliant green are all made up in 20 per cent. alcohol, and are used in 1 per cent. strength. The meroxyl is used in one-half of 1 per cent. strength, and is made up entirely as a watery solution. The action and results of mercurochrome were the same as meroxyl, but meroxyl is given preference in use because of its nonstaining properties. Brilliant green, a dye which as yet has not been employed to a great degree, has been found to be of good use in combating streptococcic infection. A more recent drug employed is one called acriviolet—a combination of acriflavin and gentian violet, which is nothing more than a combination of the two drugs employed by the author.

Ear Polypi in Acute Otitis Media. Aural polypi are divided by E. M. Seydell[2] into: (1) Granulations or round cell polypi, or mucous membrane polypi; (2) Fibromata; (3) Myxomata; and (4) Transitional forms.

The granulations consist of a hyalin homogeneous stroma traversed by a more or less fibrous framework, in which scattered or closely packed round cells, and sometimes also few spindle cells, are embedded. By metamorphosis of the round cells into spindle cells the soft polypi may obtain a hard fibrous character. The surface of these growths is rarely smooth, having deep glandlike indentations. They are covered with epithelium which shows all the transitional stages from simple ciliated to pavement. There may be several different forms on the same polyp.

The true *fibromata* have a long fine fibrillar stroma, in which spindle cells are often interspersed. They are not as rich in blood vessels as the granulations. Their surfaces are smooth and covered with stratified squamous epithelium.

The *myxomata* differ from the fibromata in that their stroma is composed of myxomatous tissue.

Most authorities agree that polypi are produced by a

(2) Ann. Otol., Rhinol., and Laryngol., September, 1925.

severe and prolonged productive inflammation of the connective tissue of the parts involved. The earliest stages of their growth can only be recognized by microscopic examination. A granulation tissue development begins in the submucosa, either breaking through the epithelium and presenting devoid of this covering, or by pushing ahead a portion of the epithelium they are found as smaller tumor masses. Most polypi spring from the middle ear, particularly the labyrinthine wall.

Treatment: Whenever polyps are found they should be eradicated as they usually increase in size, thereby blocking drainage. Small polypi may be treated with caustics, the larger ones being removed carefully by the use of the snare.

The author reports two cases illustrating the presence of polyps in acute otitis media. He concludes that this is exceptional inasmuch as polypi usually result from chronic inflammation and are therefore mostly found in chronic otitic cases.

[Possibly the acute polypi cases were secondary to a chronic condition since patients frequently have a chronic otitis media without being conscious of it.—Ed.]

Tuberculous Disease of the Middle Ear. H. W. M'Cart[3] has analyzed the case records of tuberculous otitis media in children under 15 years of age over a period of ten years (1915-1924). The total number of cases of chronic suppurative otitis media, of all ages, during this period was 4,285. Of these, 55 (1.3 per cent.) were tuberculous.

A resumé of these tuberculous cases shows the following:

1. There appear to be two groups of cases of tuberculous otitis media: (a) Tuberculous otitis media in children under 15 years of age (46 cases). In the writer's series, the maximum age incidence was two to five years. (b) Tuberculous otitis media in adults. This group includes the remaining nine of the 55 cases

(3) Jour. Laryngol. and Otol., July, 1925.

reported on, and in seven of the nine pulmonary phthisis was considered as the primary focus.

2. Route of infection: (a) Eustachian tube; (b) blood stream.

3. The form of nourishment in children plays an important role. In the present series, 75 per cent. of the children whose nourishment was noted were fed on unboiled cow's milk.

4. Tuberculous otitis media in children is usually milk-borne, and therefore the bovine type of tubercle bacilli is present. This was proved by the work of John Fraser and A. P. Mitchell.

5. In 4,060 cases of chronic middle ear suppuration (of all ages) 845 radical mastoid operations were performed (21 per cent.). Of these, 31 (4 per cent.) were tuberculous. Practically 100 per cent. of children under two years of age, undergoing radical mastoid operation, were suffering from tuberculous otitis media.

6. Clinical aspects. Tuberculous otitis media appears as a rule to begin insidiously. In 25 of the 46 cases the first symptom was aural discharge. Enlarged glands were present about the ear or neck in 94 per cent. of the cases. Facial paralysis was present in 17 of the 46 children (39 per cent.) and not in any of the adults.

7. Findings at operation. Cortical perforation and caries of the bone are mentioned in 65 per cent. and 52 per cent. respectively in the present series of operations on children. Sequestra were found in 20 per cent. The labyrinth was frequently affected.

8. Intracranial complications, other than tuberculous meningitis are rare.

9. Pathology. The diagnosis of tuberculous otitis media was proved by microscopic examination in 26 of the operations on children. J. S. Fraser shows that tuberculous infection passes up the lumen of the eustachian tube to the middle ear; it may also pass to the brain along the subarcuate vessels. He mentions three

forms of tuberculous otitis interna: (a) Infiltrating. (b) Necrotic, and (c) Chronic. He found that labyrinthitis is more likely to follow tuberculous otitis media than non-tuberculous, the infection passing by way of the windows.

10. End-results. Total numbers of cases—55. (a) Forty-six were children under 15 years of age. (b) Nine were adults.

Hysteria and Middle Ear Suppuration. In hysteric patients the examiner is apt to be deceived by symptoms that seem to indicate a threatening or beginning complication, and which not infrequently prompt an operation that may be not only superfluous but even contraindicated. According to H. Beyer[4] such patients manipulate the thermometer (immersion in hot coffee, rubbing on the bed linen, rapid knocking) to make it register a temperature higher than actually exists. Tenderness of the mastoid, especially at the tip, is not infrequent in spasms of the musculature of the throat and neck, such as often occur in hysteria. The otoscopic picture may be altered by chemicals, such as acetic acid or formalin, introduced into the ear by the patient.

Some patients try to produce or to simulate aural hemorrhage (pin-pricks into the wall of the meatus or instillation of menstrual blood). Attempts are made also to simulate suppuration by introducing feces or urine on cotton swabs. Symptoms of labyrinthine irritation, nystagmus, disturbances of equilibrium, and vomiting are likewise simulated, and hysteric patients can even voluntarily produce spontaneous nystagmus. Under such conditions, however, the nystagmus remains irregular, undulating and indeterminable; above all it lacks the rotary component, for one is dealing with a simple, indefinite fixation nystagmus.

In testing the alleged disturbances of equilibrium, momentary falling occurs when the eyes are closed and heels are together and there is awkwardness of motions

(4) Beitr., z. Anat., Physiol., Path. u. Therap. d. Ohres,

in the finger-nose test. There is a marked degree of vertigo, under the eyes of the physician, but when at home the patient is able to perform household duties, even mounting a ladder, when necessary. It is of great value to have the patient carry out the pointing reaction with eyes closed (Beyer-Lewandowski), since the motion of the hands during pointing deflects the attention and the patient stands firmly and securely. An especially striking feature is hysteric paralysis of the facial nerve, which is really a spasm of the nerve. Hysteric patients are able to maintain this apparent paralysis for a surprisingly long time, but of course it is absent during sleep; hence a simple examination at night suffices for a correct interpretation.

To guard against such simulations, it is necessary, when contradictory findings are obtained in an accurate examination of the ear, to search for stigmas and hysterogenic zones and to observe the patient's psychic behavior. The temperature is taken under observation, preferably by rectum. The nature and amount of suppuration are controlled by a fixed protective bandage; tests of the cochlear and vestibular apparatus are repeatedly made, if possible by different examiners. Accurate examinations of the fundus and visual fields are made by the neurologists. In checking the most striking symptoms, isolation of the patient is helpful, since this removes the stimulus of sympathetic attention.

Spurious operations are to be avoided. Where isolation cannot be carried out the author advises the patient be transferred to a neurologist.

Concerning the Origin of Cholesteatoma of the Middle Ear. W. Lange[5] comes to the conclusion that a cholesteatoma can develop after any inflammation in the tympanic cavity. The epidermis may immigrate through large perforations of the drum membrane and epidermatize the mucous membrane which is denuded of epi-

(5) Ztschr. f. Hals—, Nasen—, u. Ohrenhlk., June 2, 1925. etc., November, 1924.

thelium. It may also immigrate without any perforation of the drum membrane if there is no resistance in the membrana flaccida. Atypical exuberant growths of epidermis are based on a proliferating inflammation. If a cholesteatoma has been formed under these conditions, an entirely intact drum membrane may remain after the releasing inflammation has healed (cases of Manasse). A certain individual disposition of the epidermis must be considered. The energy of the growth of the epidermis varies according to age and unknown general constitutional factors. Cholesteatomas will develop more easily in individuals with a strong epidermis. The observations after radical operations agree with this.

It is generally observed that after operations for cholesteatoma the bone cavities epidermatize well and more quickly, even if all epidermis is removed from the middle ear cavities. After rarefying bone diseases without cholesteatoma, the epidermatization proceeds much more slowly also if the walls of the cavity are formed by firm bone after an operation. The cholesteatoma is the expression of a healthy constitution of the epidermis. It is not surprising that cholesteatomas may develop in various ways. In some instances the author found a formation of cholesteatoma in the middle portion of the tympanic cavity into which the epidermis had grown through a large perforation, beside a cholesteatoma which had developed from the membrana flaccida. It was entirely separate. Pneumatization furthers the growth of cholesteatoma. Its effect is confined to the age of pneumatization, the first years of life.

If the cholesteatoma develops during the first year of life it encounters in the middle ear cavities a physiologic process which represents a breaking up of the bone by the subepithelial tissue, the first act of pneumatization. The growth of epithelium is very vivid at this time and the second act of pneumatization, the secondary wall formation of the cell is suppressed through the rapid growth of the epidermis cyst. Rapid development of

large cholesteatomas must result during the first years of life. The surprising extent of cholesteatoma in infancy which has repeatedly led to consider them to be congenital tumors, can be explained by assuming an inflammatory genesis which is supported by normal pneumatization. A chronic suppuration is not the condition sine qua non for the formation of a cholesteatoma. The drum membrane may be intact if a proliferating inflammation of a longer duration is present. The cholesteatoma is a cystic or cystlike grow of epidermis on an inflammatory basis. All this does not exclude that real tumors, for instance, carcinomas, can develop from these pathologic formations of epidermis. General experience points to the fact the squamous celled epithelioma can develop on the basis of a chronic middle ear suppuration. The objection that the suppuration is secondary to the carcinoma can, as a rule, be met only with difficulty or not at all. The origin of the development of a squamous celled epithelioma in the middle ear has not yet been reported.

Otitis Media in Measles. W. T. Gardiner[6] reports on 1331 cases of measles which were admitted during the past four years to the Edinburgh City Hospital for Infectious Diseases. Of the total number, 181 (13.5 per cent.) developed otitis media. In this group 96 were under two years of age. Bronchopneumonia therefore overshadowed the accompanying otitis media and the importance of active ear treatment seemed secondary. If adenoids were present, their removal hastened cessation of the ear discharge. Generally speaking, in the cases in which there were no adenoids, or in which they had been previously removed, the infection was a mild one, and the otorrhea correspondingly milder in character, responding readily to conservative treatment.

The conclusions drawn by the writer from the material studied are as follows: (1) Uncomplicated measles does not give rise to such a severe form of otitis media

(6) Jour. Laryngol. and Otol., November, 1924.

as does scarlet fever. (2) Otitis media accompanying measles is confined to the mucous membrane to a far greater degree than in scarlet fever, as evidenced by the frequency of central perforations. (3) It may arise and cause a mastoid complication in cases where there are no adenoid vegetations. (4) When adenoids are absent, the middle ear suppuration responds to conservative treatment. When they are present, they tend to keep up the discharge and to render mastoid complication more probable; their removal usually clears up the discharge very rapidly. (5) Otitis media in cases of scarlatinal measles is extremely serious, involves widespread destruction of bone, and the involvement of important structures. Where mastoid tenderness persists, early operation is essential. (6) The "follow up" of measles-otitis media cases is most important, so that proper treatment, operative if necessary, may be carried out.

Results of Zinc Ionization in Chronic Otorrhea in Over 600 Cases. A. R. Friel[7] uses the method of zinc ionization outlined by Professor Leduc of Nantes in 1900. The patients are schoolchildren suffering from chronic otorrhea. In some cases the ionization is supplanted by the insufflation of boracic powder. No other local treatment is carried out.

The author gives a table of the causes of chronicity with the number of cures from ionization. Tympanic sepsis yields most readily. The cause of the chronicity was found in the nose and throat in only seventeen out of 616 cases.

A second table gives the number of cases ionized with the number of treatments, and the number of visits to the clinic before the discharge ceased. In 234 patients the average number of ionization treatments necessary for cure was two.

The object of the ionization is to remove the sepsis, so for this reason the ionization must reach the seat of the

(7) Jour. Laryngol. and Otol., February, 1925.

disease. With this in view, aural polypi are first removed, disease in the nose and throat is treated; in inaccessible attic disease, an ossiculectomy is done, or where indicated a partial or complete mastoid operation is performed before ionization is carried out.

A third table summarizes and groups the causes of chronicity and outlines the treatment of each group.

The author's conclusion is that ionization is a cure for sepsis, and as chronic otorrhea is frequently maintained, owing to sepsis, zinc ionization is often a remedy for chronic otorrhea.

Chronic Progressive Deafness Treated with the Galvanic Current. Some encouraging results are reported by M. L. Harris[8] in the treatment of chronic progressive deafness with electrotherapy. The theory underlying the action of the galvanic current is that the negative pole causes a hyperemia, local elevation of temperature and softening with absorption of scar tissue. If this is true in other parts of the body the author felt it should hold for scar tissue in the middle ear. The method of application is simple. The external auditory canals are lightly packed with wicks of absorbent cotton moistened with physiologic sodium chlorid solution to the drum membrane, and the negative pole is applied biaurally to this cotton. The positive pole is applied by means of a copper spatula to the tongue and hard palate, good contact being obtained when the mouth is closed. The current is turned on gradually to the limit of tolerance, not to exceed, however, 2 ma. The galvanic current is allowed to flow from twenty to twenty-five minutes, and then the sinusoidal current for five minutes. The latter current increases the local metabolism and stimulates the muscles and nerves of the middle ear.

Treatment is given every other day and bi-weekly tests are made to note the progress. Examination of the drum membrane immediately after treatment shows the upper half markedly congested and the patient will

(8) Laryngoscope, January, 1925.

state that he has an agreeable feeling of warmth in the ears. This feeling of warmth usually lasts for 24 hours. Of eleven patients treated, nine showed considerable improvement, especially in that there was much less tinnitus.

Treatment of Chronic Middle Ear Suppuration. An attempt to cure chronic middle ear suppuration without resorting to the radical mastoid operation has been made by Alfred Blalock and S. J. Crowe.[9] They state that the ideal therapeutic procedure is one that cures the disease with the minimum of danger to the life of the patient, and with the least possible damage to normal tissues and to the function of important organs.

In a series of 86 cases in which the radical operation was clearly indicated they adopted the following procedure. The infection in the mastoid cells is thoroughly removed, and the passage from the antrum into the middle ear is enlarged as much as possible by removing the cells in the posterior part of the zygoma. If kept open, this permits through and through irrigation of the middle ear cavity with surgical solution of chlorinated soda, the fluid entering the middle ear by way of the antrum and coming out into the external auditory canal through the defect in the drum. If polyps and granulations protrude through the drum, an opening is made into the external auditory canal, external to this membrane, and the obstructions to drainage are carefully removed. It is dangerous to remove an aural polyp with a snare or with traction, because the point of attachment may lie over the facial nerve or near the stapes.

The primary object of these experiments was to determine the following points:

1. Is it possible to stop the discharge with a simple mastoid operation with through and through irrigation of the middle ear cavity?

2. Do patients treated in this way have a recurrence

(9) Arch. Otolaryngol., March, 1925.

of the cholesteatoma, polyps or granulations, and has any patient subsequently had an intracranial complication, such as brain abscess, meningitis or labyrinthitis, as a result of this incomplete operation?

3. Is the hearing improved as a result of the conservative treatment, or is it any better than in a similar group that has had a radical mastoid operation?

The data on which the answer to the before-mentioned questions were obtained in the majority of the 86 patients studied was by writing directly to the subjects. The answers indicate that the following statements are true:

1. That it is possible to stop the discharge and sterilize the middle ear cavity with the treatment, as outlined in the foregoing. Such a result, however, depends on the thoroughness of the operation and the most careful attention to the postoperative treatment. No packing or drains of any kind must be used in the operative wound or in the external auditory canal because of the danger of introducing skin staphylococci. Cotton applicators used in cleansing the external auditory canal and middle ear must be sterile. The skin around the wound must be shaved at frequent intervals during the three weeks of postoperative treatment, and the entire area around the ear must be kept clean. Silver nitrate is applied to the granulations of the middle ear when indicated.

2. No patient in the entire group has had any intracranial or inner ear complication. Thirty-four have been observed for less than 1 year; 35 from 1 to 5 years; and 17 from 5 to 10 years. Only two of these patients have subsequently had a radical operation.

3. As regards the hearing they have reliable data on only 63 cases: 60 per cent. of these report that the hearing is better than before operation, and only one patient writes that the deafness has increased since the operation.

When the pathology of cholesteatoma is considered,

it is difficult to see how a simple mastoid operation with through and through irrigation could prevent a recurrence.—Ed.]

Chronic Otorrhea of the Insane. J. D. Whitham[1] has no doubt that severe infectious processes always produce temporary derangements of the sensorium. When such processes are long continued or exhausting, in many cases the result is a prolonged or permanent psychiatric condition. It seems possible that extensive necrosis in the temporal bone with continuous absorption of virulent toxic products in a mentally unstable individual is an important factor in aggravating a psychosis. With this idea in mind the writer has operated on seven mental cases, with the object in each of curing a chronic discharging ear.

These were selected from scores of mental cases, who had chronic ears, for, generally speaking, only those were operated on who indicated the presence of an extensive necrosis in the temporal bone. After examining the ears of many hundred insane the writer has been astonished at the relative frequency of chronic suppuration.

He offers the following summary:

Four of the seven cases showed marked mental improvement, two showed considerable improvement, and in two patients the operation did nothing to arrest the progress of the disease. In all cases the operation cured the aural suppuration.

One of the failures was a case of general paresis, which should not have been operated upon, and would not have been touched had the diagnosis been certain at the time of the operation, the other failure died of pulmonary tuberculosis ten months later. There is no intention to claim directly or by inference that any patients were cured of insanity, but the mental improvement after operation was so striking in some of our patients that we feel amply rewarded for our efforts.

(1) New York State Med. Jour., Apr. 24, 1924.

Operative Surgery of the Mastoid. Suggestive points in the operative surgery of the mastoid which assure rapidity in healing are given by John F. Barnhill.[2] At present this operation may be performed practically without danger, and the average time of healing is probably something less than three weeks. Formerly the postoperative period, change of dressing was painful and the long period of wearing some sort of bandage was embarrassing. Today all this is changed—the healing is rapid, the dressings comparatively painless and bandages are necessary but for a few days. These happy results have been brought about by a better knowledge of the pathology involved, early and positive diagnosis, and by the development of a greatly improved, one might perhaps say, an almost perfected technic for this class of mastoid operation.

Some of the principal points in this operation, the strict observance of which gives quickest healing and safety, are:

1. The same care should be taken to prepare the field of operation and to protect it from a non-sterile environment during the operation that would be considered adequate in case the operation were to be done on the brain or in the abdominal cavity. For the purpose of sterilization the author uses ether, iodin and alcohol sequence, and has no desire to change.

2. *Exposure of the Affected Osseous Surfaces.* The author has little patience with efforts at operation made through inadequate incisions, for it is undoubtedly true that large wounds will heal quickly if all the disease is removed, whereas small wounds never heal if some seriously affected part is left behind. An adequate exposure of one's work is the best insurance that all of the disease will be discovered and safely removed.

The incision should be but slightly beyond the tip

(2) Ann. Otol., Rhinol., and Laryngol., March, 1925.

toward the neck and only just far enough to enable the operator to detach such portions of attached muscle as may be actually necessary. Some years ago the muscles were very completely detached from the mastoid tip in all cases before opening the mastoid antrum and cells, and, therefore, before it could be known whether or not extensive detachment would be helpful. There are many cases in which but little of the muscle is made unnecessary pathways of infection are opened, more postoperative pain than necessary is invited and prolonged healing often results.

3. *The Extent and Manner of Bone Removal.* The mastoid antrum should be opened in every case, and every suspicious mastoid cell ought to be eradicated. The osseous wound does better, heals quicker and more certainly if left a little rough. It is an error in technic to hone or polish the osseous cavity of a mastoid wound, for to do so delays to some extent the final healing of the wound. The posterior meatal wall should in every case be cut away partially, almost to the tympanic ring, much after the manner of the Heath operation. This sharp osseous septum, which formerly was left standing between the external meatus and the mastoid cavity, has no function and is undoubtedly a hindrance to quick healing. When cut away it allows the soft structures to drop into the wound on closing, to partially fill the wound, and thus very greatly to favor rapid and complete healing. The removal of this useless obstructive osseous structure will enable cure to occur at least a week earlier than if the same is left standing. This removal of the postmeatal wall does not end in any asymmetry of the two ears after healing is complete.

4. Another important point in the technic of securing the quickest possible time in healing is found in the management of the mastoid tip. There can be no argument concerning the fact that all infected mastoid cells located in the tip should be completely eradicated, but this can be done, and should be done, without molesting

the osseous shell which forms the floor of the tip and internal wall of the tip. If this hard shell is left in situ the necessity for muscle detachment is wholly avoided or reduced to a minimum, drainage will be equally good, while postoperative soreness and stiffness of the neck due to muscle infection will almost certainly be avoided. In most cases no good reason whatever can be assigned for completely removing the tip of the mastoid. To leave it allows all the neck muscles to function, and because these muscles are not cut, muscle infection is avoided, and another point in securing quick healing is established.

5. *Drainage and Packing.* It was formerly thought necessary to pack all mastoid wounds until healing was complete. "Secure healing from the bottom" was the dictum. This plan usually insured safety and ultimate healing. However, as a result of this method, the cure was often long delayed, an unsightly, depressed scar remained, and the several weeks or months of daily change of the packing was more or less painful. This procedure, fortunately, has largely fallen into disuse. Healing by granulation from the bottom of the wound was a slow and entirely unnecessary process, but for the reason that the mastoid operation had been performed in the midst of sepsis this technic was long thought best and safest, and was reluctantly given up by many in great fear of the supposed evil consequences likely to follow any other method.

To confine these patients to the bed for any undue period, as was formerly done, is not necessary to safety and often retards progress to early cure. Therefore, unless the case is already prostrate from the disease which caused the mastoid affection, it is a wise plan to allow the patient to sit up and to be about the room on the second or third day after operation.

6. Employment of the modified blood clot dressing was a long step forward to quick healing in mastoid operations. Infections of the clot sometimes occurred.

but it was in due time observed that serious infection, or at least serious consequences following infection of the clot, could be avoided in nearly every case by strict observance during the operation of all the points of surgical technic herein discussed, and especially those dealing with the preparation of the wound, thoroughness in removal of all infected tissues, and especially of the insertion of a proper drain for the first 24 hours.

Any suppurating or infected cell that may be overlooked at operation will always break down the blood clot, set up danger and slow down or completely arrest the healing process. Hence every point of even minor detail must receive attention during the operation. An item of value in preparing all mastoid wound to receive the blood clot is that of attention to all minute bone chips and grit from the use of the chisel and hand burr. Small bone chips are easily overlooked, and bone grit from the burr is, of course, not easily seen. Both or either must, however, be completely removed if the blood clot is to be used and quick healing is to be expected. Attention to the simple detail of completely removing this operative debris is of prime importance in securing quick, certain and painless healing of the operated mastoid. The author's plan, before finishing the wound, is to drop into the mastoid cavity a dram or more of pure hydrogen peroxid, and after a few moments, to syringe the same away with sterile water of a temperature at about 110° F. Neither the peroxid nor water are used with the primary thought of sterilizing the wound, but rather to blanche the bone and to make more certain the removal of all osseous debris. The foaming peroxid seems to entangle the osseous particles, which may then readily be washed away by means of the hot water. The bone is whitened, and the small bleeding is checked by this procedure, the resulting clean wound giving the operator a better opportunity to make a final inspection of the cavity for any pathology that may have been overlooked.

When the wound is known to be thoroughly operated and sterile, a small rubber tissue drain is inserted into the open cavity of the mastoid antrum. This drainage tissue is removed at the first dressing and no other is inserted. Insertion of the drain into the antrum is best because it then drains away any suppurative product from the middle ear. Mere insertion of the drain into the mastoid wound may invite infection of the clot from infectious products remaining in the ear.

7. *The Sutures.* Placing the sutures would seem too simple a procedure to mention. However, there are points connected with it which must be observed if comfort and quick healing are to follow. In cases where the soft structures of the mastoid are thickened by infiltration, caution is necessary not to tie the sutures tightly, since more swelling than is already present usually follows the operation, and if tension is great on the sutures both pain and suture abscess will result. Suture abscess may infect the underlying blood clot and other healing parts, and this would of a certainty greatly complete healing of the wound. Four sutures of catgut are used, two of which are usually removed on the second day and the remaining ones on the fourth day. Sutures of silk, silkworm or other non-resisting material are never so comfortable nor safe, and never are conducive to as quick healing as that secure from the more elastic catgut.

Following the above plan of operation for acute mastoiditis, there is usually no suppuration from the wound. The drainage is small and consists of serum. The drain tissue is removed on the first or second day and none other replaced. The external auditory canal is mopped dry, if necessary, with alcohol and the line of sutures over the mastoid wound are swabbed over with the alcohol. This very simple attention is all that is necessary in a very large percentage of cases, those that follow severe infections as well as the mild cases doing about equally well. Even when the dura has been uncovered, or where an extradural abscess has been evacuated, the

wound is closed over as above described, and the after treatment is carried out along the same simple lines, for experience has shown that in the more extensive cases, where the dura is exposed, or where infection seems menacing, do best under the simple plan of treatment. Of course, in cases where there is a reasonable question as to whether or not all the products of the lower sutures, pack the wound and keep its depth under observation. The cases in which this plan is wise are few, for should the wound do badly, in any case the difficulty is shown in pain and rise of temperature, in which case it is not a serious or difficult matter to release the sutures, open the wound widely and remove the source of trouble. The wound may then be packed and otherwise treated as was formerly done when packing was the rule in every case.

The Significance of Bacteremia Following Mastoid Operations. The significance of bacteremia following mastoidectomy as an indication of lateral sinus thrombosis calling for operation on the sinus and internal jugular vein has been greatly exaggerated. J. H. Harter[3] adduces evidence to show that, if blood cultures were made not only in the presence of high fever or septic symptoms, but also where the recovery takes an uneventful course, bacteremia would not be considered so uncommon in cases of the latter kind. The sinus operation has often been performed on the indication of bacteremia with septic temperature without finding a thrombus, and there is accumulating evidence that spontaneous recovery takes place in such cases.

The author reports two cases of this kind, concerning boys of four and eleven years, who recovered without operation, although streptococcemia with septic temperature developed after simple and radical mastoidectomy, respectively. On the other hand, if the patient is extremely sick or septic, with a daily rise and increasing diurnal variation of the temperature curve, and with a

(3) Northwest Med., January, 1925.

steadily mounting white count, operation on the lateral sinus and jugular vein is indicated, even if no bacteremia can be demonstrated. In borderline cases, however, the presence of persistent bacteremia with an increasing number of colonies per cubic centimeter is of decisive significance, whereas its absence will make one think more strongly of some other complication (erysipelas, etc.). It appears advisable to give a blood transfusion while the diagnosis is being worked out.

X-ray of Mastoiditis. Seven cases are reported by S. G. Dabney,[4] illustrating the necessity for very careful interpretation of *x*-ray films in mastoid infections. The author believes that much has yet to be learned in regard to reading these pictures. It has frequently been said that the picture should be interpreted by the attending surgeon, and there is much in favor of this. From the small series of cases presented, the author offers the following tentative conclusions:

1. In the presence of positive clinical indications a negative *x*-ray examination should not deter one from operating.

2. This should be explained to the patient or family before the picture is made in such cases.

3. The most valuable report from the roentgenologist is the statement that the cell walls are broken down.

4. No great importance is to be attached to the report of slight cloudiness of the mastoid cells unless at the same time the clinical symptoms are positive.

5. In doubtful cases *x*-ray examinations repeated at several days interval may be of much value.

6. In chronic suppurative otitis media it has long been known that sclerosis of the mastoid generally exists. In these chronic cases the *x*-ray often shows only the sclerosis, and does not inform the physician as to such other conditions, as cholesteatoma.

7. To understand the relation of the *x*-ray picture

(4) Laryngoscope, September, 1925.

to clinical symptoms, it is desirable to keep the record of operative findings in connection with the picture. Because of his having opportunity to see the work of many surgeons, it would be best for the record to be kept by the roentgenologist, who should familiarize himself reasonably well with the anatomy of the temporal bone.

Acute Mastoiditis Caused by Streptococci (Hemolyticus and Nonhemolyticus) Associated with Pneumococci. A plea for early operation in these cases is made by P. S. Stout.[5] This author draws an analogy between acute mastoiditis and appendicitis. Before the days of McBurney and Murphy, the two Prices, the two Deavers, the two Mayos, and others, appendicitis was looked upon just as mastoiditis is looked upon at the present time by most physicians and the mortality was about 15 per cent., that is, 85 per cent. got well without operation and 15 per cent. died, or operation was deferred and done only as a last resort. But these surgeons came along and showed that early operation properly done would save about 99 per cent. As a result there developed the conservatives who waited, and the radicals who operated. However, slowly but surely the so-called radicals won, so that now only very few physicians wait about operation after having once made a diagnosis of appendicitis.

Acute mastoiditis, like acute appendicitis, is always a grave condition, and it is very difficult to determine which case will get well without operation and which one will not. In the streptococci or pneumococci forms, hours, not days, count. The author cites several cases to illustrate this point, and the necessity of early operation.

The diagnosis of streptococci or pneumococci mastoiditis may be made fairly definitely. The patient has but little prodromal symptoms, possibly a slight cold,

(5) Laryngoscope, April, 1925.

so-called grippe, influenza. There is pain in the mastoid area, great pain on palpation, and little or no pus from the external canal. Incision of the ear-drum usually brings forth blood and some serum, but little or no relief from incision of the drum. The temperature ranges from 99.5° to 102° or 103°, the pulse, 84 to 100. The leukocyte count is not high at first. Sometimes streptococci are found in the blood from the drum head incision.

In conclusion the author states that he can remember 35 years ago when the question as to whether to operate or not to operate for appendicitis was the point at issue. The arguments were pro and con, the same then as the arguments are now for acute mastoiditis. He feels that 25 years from now otologists will be reporting hundreds of acute mastoidectomies with almost no mortality, the same as surgeons are reporting hundreds of appendectomies with almost no mortality, regardless of the infecting agent, providing that they get the cases early enough.

Mastoidectomy: With Special Attention to Local Anesthesia in This Operation. After using local anesthesia and finding it safe, simple, and entirely satisfactory, S. M. Blackshear[6] wonders why it is not more universally used. It is contraindicated in young children and nervous adults, also in cases of radical mastoid, where anesthesia of the middle and external ear is necessary.

The author's technic is as follows: A hypodermic of morphin sulphate gr. ¼ and atropin sulphate gr. 1/150 is given one-half hour before operation. After shaving the side of the head on the affected side and cleansing the external auditory canal with peroxid and alcohol the skin is cleansed with benzin and iodin.

First the skin is injected with either apothesin or novocain in 0.5 of 1 per cent. solution with three minims of adrenalin to the ounce, beginning above the

(6) New Orleans Med. and Surg. Jour., September, 1925.

zygoma and extending the infiltration to below the tip of the mastoid process with a wide margin of surface so as to have the anesthetized area extend considerably beyond the field of operation. Then the needle is inserted deeply under the periosteum and as the solution is injected the whole mass of tissue is elevated, including the external ear. Lastly the needle is inserted straight in and along the posterior wall of the external auditory canal which is thoroughly infiltrated. Since there is no nerve supply to the bone the operation may proceed further as under general anesthesia.

The author uses a trephine to remove the cortex covering the antrum, and completes the operation with rongeur forceps and curettes. Closing the wound with through and through sutures of silkworm gut which include the periosteum with a blood clot has been found to shorten the period of convalescence very materially. As a rule the author uses a rubber drainage tube, which is inserted straight in to the antrum, and is anchored with a suture through the skin. The tube is removed at the end of the third day.

The Clinical Importance of Nasal Sinus Infection in Mastoiditis. Experiences in which P. Watson-Williams[7] found unexpected sinus infection in connection with mastoiditis led him to look with greater regularity for intranasal sepsis in cases of mastoiditis. He has tabulated the results of nasal sinus exploration in a continuous series of 42 hospital cases in which such exploration with cultures of the contents extracted were made. In 28 instances the sinuses showed infection; in 14, negative findings. In other words, the sinuses were infected twice as often as they were normal. In 25 of the 28 cases showing sinus infection the side of the nose corresponding to the ear operated on was infected. In 13 the nasal sinus infection was found on both sides; in 12, on the side of the

(7) Jour. Laryngol. and Otol., October, 1924.

ear operated on; in 3, on the side opposite the ear operated on.

Many of the 42 cases were in young children, and, while the maxillary antrums were explored in all, the sphenoid sinuses were explored in only 14. In two cases the sphenoid sinus alone showed infection; in six the sphenoid sinus infection occurred in association with infection of one or both antrums. The organisms recovered from the infected sinuses were pneumococcus, streptococcus and staphylococcus.

Mastoid Surgery. C. F. Welty[8] has never had a single death following acute mastoid operation in a series of about 400 cases during fifteen years. During the last ten years, re-operation has been necessary in only one exceptionally complicated case. The most important indication of a suppurated mastoid is bulging of the posterosuperior wall two weeks or more after incision of the tympanic membrane. Pulsation of pus through the perforation indicates pus in the mastoid; also a bulging posterosuperior wall. Facial paralysis during acute otitis is an indication for immediate operation. Acute otitis should not be allowed to exist for more than six weeks from fear of performing an unnecessary operation. Acute mastoiditis calls for surgical interference, if it does not improve steadily from the third to the fourteenth day.

The author removes every individual mastoid cell that can be found with a "searcher" (smaller than a pinhead in size), opening the attic freely and removing all cancellous bone. Both the cavity and the ear are packed with plain gauze, with a few stitches at the angle, and bandaged, with an ice-cap to the ear for 24 hours. Increase of temperature following the operation indicates either remaining infected cells or acute infectious disease, or cerebral complication (lateral sinus thrombosis, and so forth). If everything remains satisfactory, the wound is dressed after four days, the

(8) Northwest Med., January, 1925.

packing being replaced by loose gauze, and then every second day unless pus appears, when the dressing is done every day. Oversized granulations are removed with the curette or with nitrate of silver fused upon a probe, the silver being neutralized with sodium chlorid solution. Deficient granulation is stimulated by a tight pack of iodoform gauze, changed daily.

In the presence of cholesteatoma, facial paralysis, caries of the promontory, caries of the attic wall inside or outside, vertigo, or any cerebral or cerebellar symptoms, a cure can be effected only by the radical mastoid operation. But in the absence of these conditions, the author has performed the acute mastoid operation with good results also in eleven out of twelve cases of chronic suppuration of the middle ear, and in the one unfavorable case, the second operation revealed that cholesteatoma had been present after all.

As to the radical mastoid operation, the author had four deaths (one from brain abscess, three from purulent meningitis) in a series of about 600 cases. The writer is enthusiastic about the skin-graft he described some ten years ago. Re-operation has been necessary only in one case during the last ten years (without success). Any case of chronic discharge from the ear (without other symptoms) that cannot be permanently cured by other treatment, calls for the radical mastoid operation or some surgical measures. After the radical operation, patients need medical attention three to four times a year for all time.

Simulated Mastoiditis Relieved by Sphenoidectomy. H. W. Lyman[9] reports four cases of mastoidalgia in which the symptoms were so severe as to lead to operations on the mastoid without abating the pain, and in which cocainization of the nasal ganglion had no effect. The cases proved to be sphenoiditis and were relieved by opening the posterior paranasal sinuses. The following salient features in the cases are noted:

(9) Laryngoscope, December, 1924.

1. The marked psychoneurotic element. Clinically, the pain and suffering described by the patients were out of all proportion to any possible cause in the mastoid region, and these symptoms had continued over a period of years without developing any gross pathology.

2. In each case, while the tenderness was very marked over a large area, there was a point of extreme sensitiveness a short distance behind the mastoid process. This tender point is quite constant in nasal ganglion headaches.

3. Operations on the mastoid had failed to relieve the pain.

4. Practically no relief was obtained by cocainization of the nasal ganglion.

5. Opening the sphenoid and ethmoid sinuses brought about marked improvement in the symptoms. Exacerbations of the sphenoiditis always caused a return of the so-called mastoid symptoms.

As the pain in these cases was posterior in its distribution, the regions supplied by the maxillary nerve being unaffected, it would appear that only the vidian nerve trunk was involved, and that these were cases of vidian neuralgia.

Local Anesthesia in Mastoid Operations. Two mastoid operations under local anesthesia are reported by S. Watkins.[1] The anesthetic and operative procedures in the first case are as follows:

One-half hour before the operation a hypodermic injection of morphin sulphate gr. ¼ and atropin sulphate gr. 1/150 was given. The anesthetic used was about 30 c.c. of 0.5 per cent. of novocain-adrenalin solution and 2 c.c. of 2 per cent. solution of novocain-adrenalin. The first injection was around the mastoid bone within a radius of from one to two inches from the external auditory canal, being farthest posteriorly. The soft tissues were infiltrated down to the bone and

(1) Kentucky Med. Jour., April, 1925.

when the needle was inserted under the periosteum the author found the sub-periosteal injection unsatisfactory as the periosteum was very firmly attached to the bone. The line of injection was somewhat in the shape of a horseshoe and was carried well forward in the zygomatic region and below the tip of the process. Three separate injections of approximately 6 c.c. each were made during this step. An unusually deep injection was made at the extreme tip of the mastoid to block the great and posterior auricular nerves; 8 c.c. were used here. The other injections blocked branches of the small occipital and tempero-auricular nerves. Next, the Braun injection between the anterior wall of the mastoid and the outer auditory canal was made, using 2 c.c. of the 2 per cent. solution. This blocked the auricular branch of the vagus (Arnold's nerve) and branches of the auricular-temporalis, which supply the osseous canal.

The operation was started as soon as the injections were completed. Incision was begun at one-half inch behind and on a level with the upper border of the attachment of the auricle and carried downward beyond the tip of the mastoid. The soft tissues were incised without any pain whatever. When the periosteum was cut, the patient complained of some pain, and 5 c.c. of the 5 per cent. novocain-adrenalin solution was injected under it, which rendered it insensitive. Then the periosteum was retracted with the soft tissues exposing the cortex. An opening was made through it with the perforator and enlarged with burr. Pus was found under pressure and a specimen was taken for bacteriological study. This opening was found to enter the antrum. Using the latter as a landmark the cells and overlying cortex were removed somewhat in a semi-circle. The mastoid was of the pneumatic type with large cells, especially at the tip and at base of zygoma. Pus was found throughout and the bone was soft and necrotic. Diseased cells

were found over and posterior to the sigmoid sinus and a small portion of the bony wall of the latter was necrotic. This was removed and the membranous wall over an area of about one-half mc. in diameter was exposed. The latter was found intact. The diseased granulation tissue and bone were removed with curettes and ronguers. Mallet and chisel were not used. The periosteum and soft tissues were closed with catgut sutures and the skin with Michel clips. An opening was left above and below for drainage.

No acute pain was felt during the operation, except when the periosteum was incised, which was not severe. The patient stated that the greatest discomfort was the "jarring," as she expressed it, which was when the bone rongeurs were used. She said, also, that the postoperative dressings hurt much more than the operation.

Masked Mastoiditis in Children. M. L. Floyd[2] has observed 26 children with mastoid abscess without the usual symptoms of mastoid disease. The symptoms observed were:

Lethargy and dehydration, both usually beginning at the same time, or the former followed rapidly by the latter, mark the onset. There is an indication of some general constitutional disturbance, usually gastro-intestinal or nutritional. Fever is present. The child loses all interest in everything, including his feeding; usually, constant arousing or the shaking of the nipple in his mouth is required to keep him nursing; often food is refused, and if forced, is immediately regurgitated. The face is expressionless, and the protective eyelid reflex is lost or markedly sluggish. As the condition advances, the face suggests extreme exhaustion, the eyes become sunken, and a shadow appears below each lower lid. These have been constant observations. No crying or suggestion of an earache is present. Closely following the lethargy, or accompanying it, the stools become loose and

(2) Arch. Otolaryngol., April, 1925.

frequent. Invariably they contain clear, glairy mucus, which at times is so great as to compose almost the entire stool. The usual number of stools is from eight to fifteen in 24 hours. They are liquid but not watery. Usually there is a residue. The number changes suddenly from one or two to many in a day. The number during the day usually equals that of the night. If Ringer's physiologic sodium chlorid solution is administered by needle, the stools become watery and a striking increase in number follow. Frequently they are noisy, due to gas, foul smelling and pungent. The gastro-intestinal condition does not respond to dietary rearrangement.

Dehydration also is present from the onset, usually being demonstrable as early as the lethargy by a lag in the elasticity of the skin over the abdomen when pinched up between the thumb and forefinger. The course is so rapid that within an hour an increase in the dehydration is noted. A point of interest is that, in spite of the repeated and persistent giving of fluids by any method, the tissues continue to dehydrate and the baby loses weight greater in amount than the fluid given; the weight chart may show from 3 to 9 ounces (from 85 to 255 gm.) loss overnight, even though the room is kept humid. The eyes become more and more sunken and the dark shadow more pronounced until, if he lives, the infant may become almost a living skeleton. The leukocyte count will range from 11,000 to 18,000.

After experiences with those patients who died after every effort was made to save them, and because pus was found in each mastoid antrum at necropsy, the conclusion was drawn that the patients presenting the foregoing symptoms should be subjected immediately to bilateral mastoidectomy after other causes were quickly eliminated. No halfway measures were attempted. Drum incisions were without benefit, as they did not drain. After preliminary supportive

treatment, usually 5 per cent. glucose solution given subcutaneously, bilateral mastoidectomy was performed, pus was found and evacuated, and, in those cases not too far advanced, the patient made a surprisingly rapid recovery.

The question at once arises: Which mastoid shall be opened? If in doubt, the answer here would be both (since only one patient in this series gave negative findings on one side). Certainly when the condition is so grave that no hope for recovery can be held, a bilateral operation is justifiable, especially if pus is found on the side on which operation was first performed. If pus is not found on that side, great probability exists that it will be found in the opposite mastoid antrum.

[Transillumination of the mastoids and a comparison of the two sides ought to indicate which mastoid is diseased.—Ed.]

Skin Grafts after the Radical Mastoid Operation. These are held in place by dental molding compound according to J. Paul DeRiver.[3] He has used the substance in two types of cases: (1) In those cases where complete obliteration of the mastoid and middle ear cavities is desired; (2) in cases in which there is a persistent otorrhea, due to infection in the eustachian tube, and when it is desired to obliterate the middle ear orifice of this tube.

In the first instance, when it is desired to obliterate completely the mastoid and middle ear cavities, after having the wound prepared for the reception of a skin graft, a sheet of sterile dental molding compound is immersed in hot water for a period of thirty seconds. It is then taken out and allowed to cool, until it becomes flexible but not gummy. The compound is now packed into the mastoid cavity and middle ear and allowed to remain there until it hardens.

With this impression of the cavity the graft is then

(3) Med. Jour. and Rec., July 15, 1925.

obtained, preferably from the thigh, taking enough epidermis to cover the cavities. It is then spread over the impression compound, raw surface outward, making sure that there is no turning in of the edges. This done, the molding compound, with the graft lying around it, is inserted into the mastoid wound and firm pressure applied, so that it will slip into place and approximation of surfaces be obtained.

The mastoid wound is allowed to remain open and a gauze pad is placed over it. Drainage is obtained through the external auditory canal by a gauze wick and a pressure bandage applied to the mastoid wound. The bandage is removed in four days, the pressure compound taken out and the wound closed under local anesthesia.

The second variety of cases is that in which the disease is confined to the eustachian tube and, after a thorough curettage, one desires to obliterate the orifice of the tube by skin graft. For this type the impression compound is introduced through the external canal into the middle ear cavity, and an impression obtained of the part of the cavity that is to be obliterated, namely, the eustachian tube.

A skin graft is taken and placed over the impression compound, raw surface outward. This is gently introduced through the external canal into the middle ear cavity. Firm pressure is made so that approximation of surfaces is obtained. The compound is held in place by cotton packs, together with a pressure bandage over the external canal. After four days the bandage is cut and the impression compound gently withdrawn from the external canal with a pair of forceps.

The success of a skin graft on any part of the body depends upon the approximation of the surfaces and this can be secured only through pressure.

Diagnosis of Acute Mastoiditis by Palpation. J. Prenn[4] finds palpation of the mastoid a physical sign

(4) Boston Med. and Surg. Jour., Jan. 23, 1925.

of value in the diagnosis of acute mastoiditis. It has the advantage of being ever ready in the trained hands to check up the condition and follow the progress of the mastoid. The outer surface of the mastoid, the one we can feel, is rough in the normal. It is perforated by numerous foramina and gives attachments to different muscles. The mastoid tip is conical in shape, almost pointed. When a middle ear abscess drains out through the antrum into the mastoid cells, inflammation starts up in the mastoid portion and we get an ostelitis and periostitis, depending upon the degree and extension. The physical result is a thickening of the bone, a rounding and smoothing out. The mastoid tip loses its pointedness and becomes bulbous. This change in the contour of the mastoid will last as long as the inflammation goes on within and will come back to normal as soon as the mastoid cells are drained out forward, back into the tympanum, and through the incised drum and eustachian tube by suction.

The method of palpation, without pressure, helps us a great deal during the course of the disease to ascertain with some degree of accuracy whether we are dealing with a mucous membrane inflammation of the mastoid cells or bone invasion.

When on palpation of the mastoid we feel a thickening, a smoothing out of the bone, a rounding out of the mastoid tip, we are dealing with a potential acute mastoiditis. The mastoid cells at this stage are already filled with inflammatory exudate; the mucous membrane lining the cells, which is continuous with that of the tympanum, is already inflamed. Hence the contour of the cortex phenomenon. But the inflammation may be confined to the mucous membrane of the cells only, and remain so until they are drained out. The cells then clear up and the bone contour comes back to normal.

When the mucous membrane inflammation extends to the bone with the destruction of the cell walls and so

on, then the external manifestations of the bone remain even in the absence of most all other physical signs.

Lateral Sinus Thrombosis without Elevation of Temperature. J. W. Holderman[5] reports a case of lateral sinus thrombosis without elevation of temperature. He analyzed 31 cases found in literature and offers the following summary:

A critical summary shows that of these 31 cases of afebrile lateral sinus thrombosis, fourteen complicated acute middle ear disease; fourteen, chronic middle ear disease, and three were not designated. Fourteen had sinus abscesses, while seventeen had firm or totally organized thrombi; in eleven, headache was present. Regarding the micro-organisms found in the sinus contents, three showed streptococci, two pneumococci, one *Staphylococcus Aureus*, one staphylococcus and streptococcus, one *Bacillus Auris*, one tubercle bacillus (?), and five none. No report was made concerning the micro-organisms found in the sinus content of seventeen of the patients.

The question of bacteremia in the afebrile type is naturally of negative interest only. The same is probably true of the culture findings of the thrombus, except in that form in which the center of the clot is infected and discharging purulent material into the mastoid cavity through a fistulous opening in the necrotic sinus wall.

Kerrison states that is acute suppurative diseases of the middle ear or mastoid, there is greater danger of intracranial complications developing from a pure rather than from a mixed infection. That these complications occur not infrequently from mixed infections in chronic middle ear suppurations is due to the fact that mixed infections are greater in relative and actual frequency in chronic suppurative otitis media, and not because the virulence of the organisms is greater in the mixed type.

(5) Arch. Otolaryngol., May, 1925.

In the reported case, *Staphylococcus Albus* was isolated in pure culture. Hence it would seem apparent that the determination of the bacterial content of the secretions from the middle ear may have an important bearing on the prognosis of possible complications.

The author's conclusions are:

1. The occurence of lateral sinus thrombosis is perhaps more frequent than might be suspected from the temperature curve.

2. An afebrile type does occur, but is relatively rare.

3. This type may occur as a complication of acute suppurative otitis media and acute mastoiditis as well as of the chronic form.

4. Persistent headache, when present, is an important symptom, particularly in the absence of other signs.

5. The bacterial findings of the secretions from the middle ear may be of value in the prognosis of intracranial complications.

6. In the afebrile form, the thrombus, if completely organized, is sterile in most cases. If the middle portion is broken down and discharging into the mastoid cavity or a perisinuous abscess, the firm distal ends are noninfective.

7. The aseptic type of thrombi do not need to be disturbed at the time of operation, nor is the ligation of the jugular vein essential to recovery.

Cerebrospinal Test for Lateral Sinus Thrombosis. Dynamic studies on the cerebrospinal fluid in the differential diagnosis of the lateral sinus thrombosis have been made by George L. Tobey, Jr. and James B. Ayer.[6]

The cerebrospinal test for thrombosis is as follows: With the patient in the lateral position, lumbar puncture is performed, and the fluid is allowed to run into a glass manometer of 2 mm. bore. The initial pressure reading is noted; also the presence of pulse and respiratory oscillations as evidence of patency of the mano-

(6) Arch. Otolaryngol., July, 1925.

metric system. Now, without in any way disturbing the patient, an assistant gently presses on one side of the neck between the larynx and the sternocleido-mastoid muscle until he feels a strong carotid arterial pulsation. During the compression, the operator watches the rapidity of the rise of the fluid column in the manometer, the promptness of its beginning and the full height to which it attains and, on release of jugular compression, the rapidity of drop in pressure. The procedure is now repeated on the opposite side of the neck, and then for comparison, both sides of the neck are pressed simultaneously.

In a typical case of lateral sinus thrombosis, there is a prompt and rapid rise in fluid pressure to twice or three times the initial reading when the internal jugular vein draining the normal sinus is compressed. The pressure rise is maximal, being equivalent to the pressure attained when both jugular veins are compressed.

Pressure over the vein draining the thrombosed lateral sinus causes either no rise or, more commonly, a slow rise of only from 10 to 20 mm. in the manometer.

These findings are characteristic of complete obliteration of the sinus. Partial obstruction from mural thrombosis naturally gives less striking results, yet is of value when correlated with the clinical findings.

1. Absence of rise in fluid pressure or very slight rise is occasionally noted in patients with no obstruction either in venous or in subarachnoid fluid systems when the cerebrospinal fluid is under low tension. This can easily be proved in a given case by injecting from 10 to 20 c.c. of physiologic sodium chlorid solution, on which dynamic tests will appear normal.

2. In certain persons with thick necks, it may be extremely difficult to locate or properly compress the veins of the neck, and in such cases an unsatisfactory response is occasionally met with when no question of sinus disease or subarachnoid block is entertained.

3. An abnormal rise in fluid pressure may result from carelessness in performing the test, leading to extraneous acts on the part of the patient. If the patient coughs, holds his breath, grunts or even moves his head or body, a prompt rise in pressure will be noted under normal or abnormal conditions, thus vitiating any record.

4. Normal difference on the two sides: The foregoing pitfalls concern bilateral as well as unilateral venous compression. A group of unselected patients in the neurologic clinic were examined with a view to determining the uniformity in response to jugular compression on the two sides. The following conclusions are justified from this study: There is often a marked difference in the height of the pressure reading following compression of each internal jugular vein separately. However, a difference of over 50 mm. is unusual and over 100 mm. exceptional. Given a normal initial spinal fluid pressure (150 mm.), the rise on jugular compression of one side usually will be ample, seldom less than 50 mm., more likely over 100 mm. The rise in fluid pressure appears to be somewhat less when the vein on the dependent side is compressed. It is likely that this is an error in technic due to difficulty in reaching this vein rather than an inherent difference in physiology.

5. Anatomic variation in the size of the lateral sinuses must be admitted, although a demonstrable difference in the size of the two lateral sinuses is unusual. This difference is occasionally observed, and in the authors' experience with this test one example of such discrepancy occurred. One must admit, therefore, a certain irregularity in the anatomic disposition of the tributaries of the internal jugular vein, variations of the facial vein being of greatest significance in this test. It is probable that the slight rise frequently observed on compression of the jugular vein on the side of complete sinus thrombosis is to be explained by coincident compression causing stasis in the ophthalmic venous system.

Brain Tumors with Otitic Complications. The otologic findings in the seven cases of brain tumor are reported by D. E. S. Wishart.[7] In view of the information gathered from this and from a previous series of cases, he submits that the evidence permits the following postulates:

1. Tumors of the frontal lobes do not interfere with cochlear or vestibular function. (He says that he is aware that cases are described which dispute this contention, but that he is arguing from the evidence supplied by his own cases.)

2. Subtentorial tumors which are completely outside the brain stem and the cerebellum, affect homolateral cochlear and vestibular function.

3. Subtentorial tumors which are in the midline and which do not involve cerebellar tissue, do not affect cochlear function. They do interfere with vestibular function. The interference tends to be bilaterally symmetrical and the functions of both vertical canal reflex arcs are affected before those of either horizontal canal.

4. Unilateral intracerebellar tumors do not interfere with cochlear function. They do interfere with vestibular function. The function of the reflex arcs of the vertical canals will both be affected before those of the horizontal canals. The tumor will be found on the side opposite to the vertical canals with the function of which there is most interference.

Technic of Operations for Brain Abscess. Two types of brain abscess are described by Charles A. Elsberg[8], one with a lining membrane which may be very thin or several millimeters in thickness, and the abscess without a lining membrane. Not only the chronic abscess but also an acute area of suppuration may early be surrounded by such a lining wall, which may be very thin

(7) Arch. Otolaryngol., July, 1925.
(8) Ibid., January, 1925.

and tenuous but which still isolates the pus from the surrounding brain tissue. It is true that the acute abscess without a lining wall is more certain to be one which contains living virulent organisms, while the pus from the chronic form is more often sterile or contains organisms of only a low degree of virulence.

As soon as the diagnosis of brain abscess has been made, the indications for operative interference are clear, unless there is already a meningeal inflammation with the presence of organisms in the cerebrospinal fluid. The error to refuse to operate should not be made when the patient already shows some signs of meningitis, namely, some rigidity of the neck and some flexor spasm at the knees (Kernig). In some patients these signs indicate a meningeal irritation rather than a true spreading meningitis, the differentiation must be made by means of lumbar puncture and immediate examination of the fluid obtained. If there is no increase of cells, or if the increase consists mainly of lymphocytes, there is no contraindication to the opening and drainage of the abscess. If, however, the fluid is turbid with a large number of polymorphonuclear cells and with bacteria on cultures, the meningeal infection is, in the majority of instances, so far advanced that the opening and drainage for abscess will seldom, if ever, prevent the spreading meningeal infection and a fatal outcome.

The approach to an area of suppuration in a temporal lobe, which is of especial interest to otologists, should be well in front of the line of the rolandic area or if the symptoms are more parietal, then well behind and above the area of the operation on the mastoid. The author illustrates the various steps of the operative procedure, but there are several guiding rules to be especially mentioned.

1. The first opening in the bone should always be as small as possible. An opening made with a trephine and enlarged with rongeurs until it measures about 3

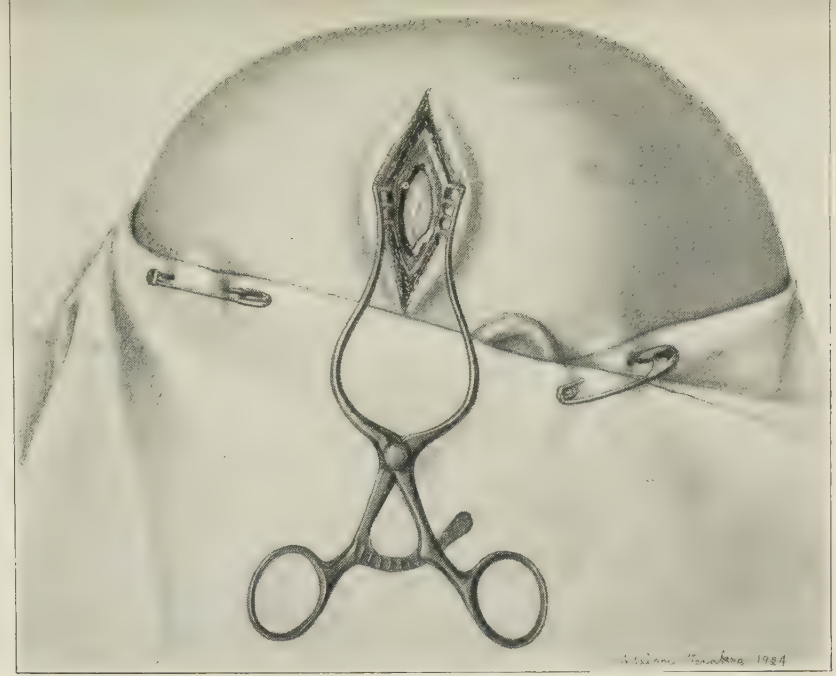
by 4 cm. is sufficient in most instances. An osteoplastic bone flap should never be made. If the abscess is found to be one without a lining membrane so that its treatment has to be different, more bone can be rongeured away without difficulty. As small an opening as possible in the bone for the drainage of a walled off abscess is of advantage not only from the standpoint of the defect in the skull that will remain, but it will also prevent a large herniation of brain tissue. This is one of the reasons why the author believes that, whenever possible, a separate incision in the scalp and a separate opening in the bone should be made for the temporal or cerebellar abscess which complicates disease of the middle ear and mastoid which has already been subjected to surgery.

2. The incision in the dura should always be a liberal one and should be almost as long as the bone defect.

3. The aspiration of the brain should never be made with a sharp needle but always with a needle with a rounded end so that when the puncture is made, the resistance of the abscess wall, if such a wall exists, can be plainly felt.

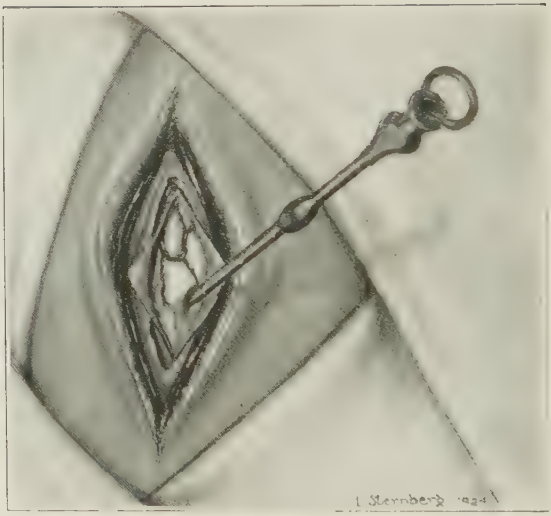
4. When the needle has entered the abscess cavity, only a little pus should be withdrawn or allowed to escape, as it is important to have a more or less distended abscess cavity for the further manipulations. A culture of the pus should be made at once by an assistant, and on a smear, the presence or absence of organisms determined.

5. The exploring needle should remain in place as soon as the pus has been located, and the meninges protected against infection by means of small strips of gauze soaked in tincture of iodin and packed between the dura and the brain on all sides, so as to wall off the area of operation from the surrounding meninges. It is his belief that meningitis due to the opening of a brain abscess should rarely, if ever, occur if this part of the operative procedure is properly carried out.



The manner of draping the head, and the automatic retractor in place after the primary bone defect has been made.—Elsberg, page 286.

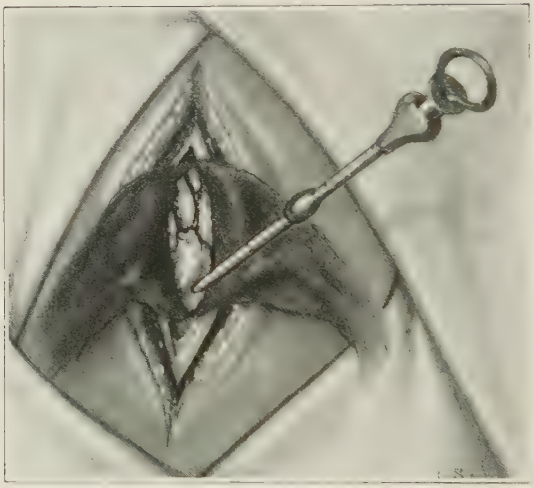
PLATE XVIII-B.



The dura incised and the needle (with stilet) in the abscess cavity.—Elsberg, page 286.

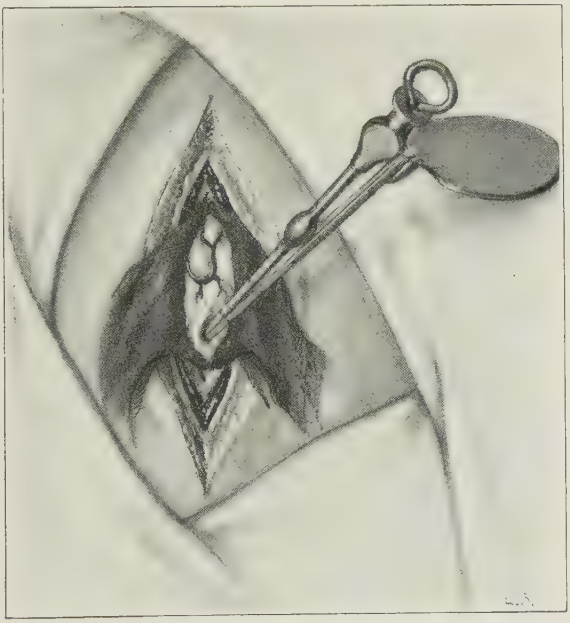
A small quantity of pus drawn into the syringe.—Elsberg, page 286

PLATE XVIII-D.



The syringe removed and the stilet reinserted. The iodin gauze packings inserted. Elsberg, page 286.

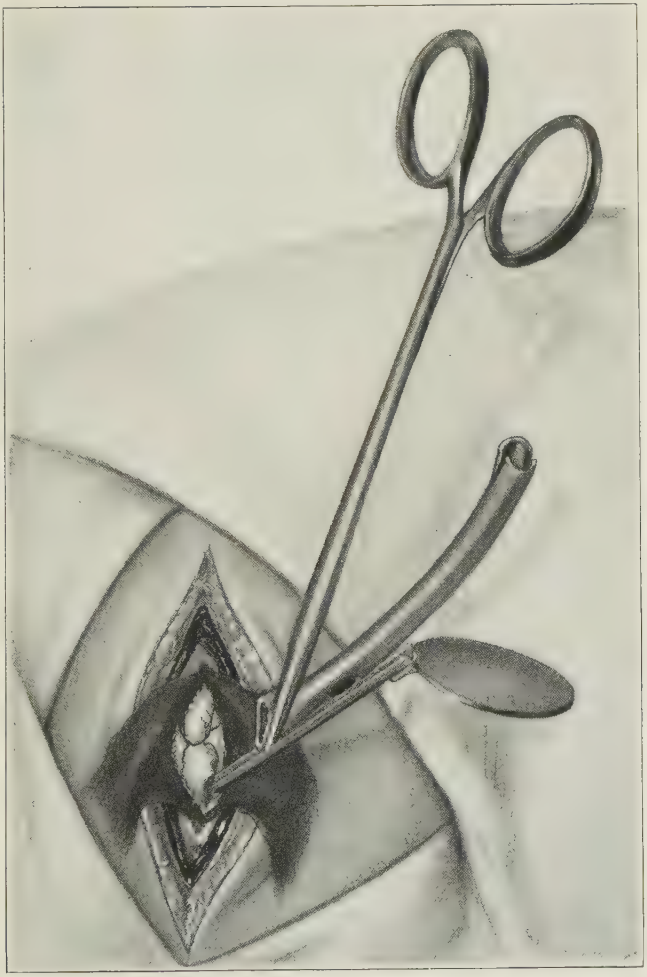
PLATE XVIII-E.



The grooved director inserted with the needle and to the same depth. (Note that both needle and director are marked in centimeters.)—Elsberg, page 286.

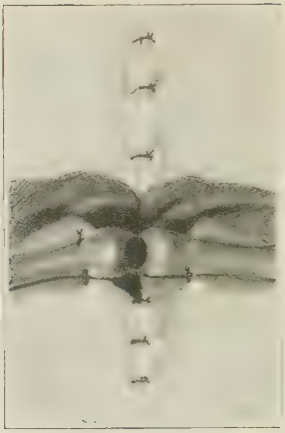
PLATE XVIII-F.

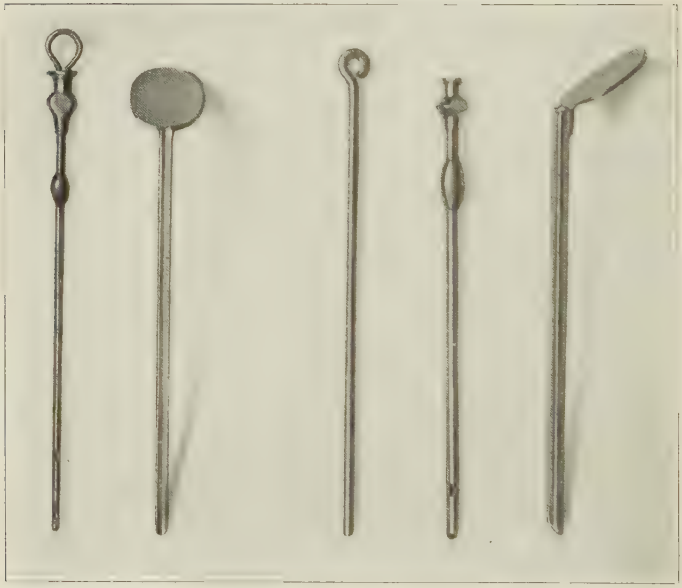
The needle removed and the grooved director still in place.—Elsberg, page 286.



The introduction of the drainage tube which is split at the outer end. —Elsberg, page 286.

A





B

A -The drainage tube sutured into place and the wound closed.

B -The needles used for aspiration and the grooved directors to fit each size of needle. (Note that the needles have rounded ends, that the groove on each director runs to the tip, and that both needles and directors are marked in centimeters.)—Elsberg, page 286.

6. The author prefers a large rigid drainage tube of soft rubber which is split at the emerging end and is fixed to the scalp on both sides by several silk sutures. This fixation of the tube is very important, for it prevents the tube being partly pulled out and then again pushed in when the dressings are changed. With the tube fixed in the manner shown in Figure 8, the dressings can be changed as often as necessary without the tube being in any way disturbed.

7. The drainage tube should never be removed but should remain in place for a number of weeks, until all drainage of pus has ceased. It is incorrect to withdraw the drainage tube after a week or two and then reinsert it. When the drainage has ceased, the tube should be gradually shortened, until it is entirely removed. The author has frequently left a drainage tube in place undisturbed for from three to six weeks and sometimes longer.

8. Hernia of the brain cannot always be avoided after the opening and drainage of a brain abscess without a lining wall; it is sometimes of advantage, but the persistence of such a hernia means that infection of the subjacent brain persists. If no infection remains, the hernia will usually shrink rapidly and its granulating surface become epidermized within a short time. Occasionally, a bulging of the brain will remain for a time, owing to a moderate degree of distension of the ventricles with fluid, and this type of herniation of the brain will temporarily, at least, recede after the withdrawal of fluid by lumbar puncture.

In abscess without a limiting wall, however, the drainage conditions are always imperfect, for the soft infected brain tissue collapses around the tube and secondary abscesses are formed in infected brain tissue which lies beyond the end of the drainage tube.

In these patients, therefore, and in all whom it is uncertain whether there is a limiting wall to the abscess, he has done an entirely different operation. As soon

as the pus has been found with the exploring needle, and while the needle is still in place, the opening in the bony skull is enlarged with rongeur forceps until a large opening in the skull, measuring about 5 by 6 cm. has been made. The dura is widely opened and iodin gauze packings are inserted all around. An incision, from 3 to 5 cm. in length is then made in the cortex, and is carefully deepened until the abscess cavity has been exposed and opened.

Instead of using a tube for drainage, a piece of rubber dam with gauze strips packed into it is inserted into the abscess cavity thus forming a Mikulicz tampon, which keeps the abscess cavity wide open.

[In draining brain abscesses in the presence of increased intracranial pressure, (which is usual) great care should be exercised to drain the abscesses slowly thus insuring a gradual reduction of brain pressure. Sudden death is liable to result from too rapid reduction of pressure.—Ed.]

Treatment of Brain Abscess. Another method of operating for otitic brain abscess is described by Joseph E. King[9].

Local anesthesia was the process chosen. Sometimes the patient will be in such a stuporous or semicomatose condition, that little, if any anesthetic will be required.

The preferred incision is three limbed in the case of temporosphenoidal lobe abscess; otherwise a crucial incision is preferred. The incision is carried down to the outer table of the skull and the three of four flaps consisting of all soft parts are elevated, reflected and are held with self retaining cranial retractors. The angulated retractors which were first used in Frazier's clinic are preferred. These give adequate exposure and prevent bleeding. No artery clamps will be required. The apexes of the flaps are turned backward and sutured with one suture to the base of the flap. A

(9) Arch. Otolaryngol., January, 1925.

trephine opening is made directly over the suspected site of the abscess with a Hudson cone drill. A small incision in the dura about 0.2 inch long is made for the purpose of exploratory puncture. Adhesions may be found obliterating the subarachnoid and subdural spaces; if not, and if an abscess is present, in the majority of cases the underlying cortex will bulge through the small incision, thus closing off these spaces; therefore, whether adhesions are present or not, these spaces will be closed off during the puncture. In addition, throughout the procedure, the wound is continually sponged out or irrigated with a surgical solution of chlorinated soda. The chances of extension of infection into the meninges are thus reduced to a minimum. When pus is obtained, the depth at which the abscess is entered is noted, a specimen is preserved for the laboratory and the cannula is withdrawn. The trephine opening is then enlarged circularly with rongeurs, to the approximate size of a half-dollar or larger. This enlarged opening in the skull should be placed directly over the abscess cavity. After the definite extent of the abscess cavity has been determined, the cranial defect thus created may have to be altered in shape so that its position will be directly over the abscess.

The dura is then incised in a stellate fashion, thus forming six pennant-shaped dural flaps. These are turned back over the bony margin of the cranial defect and loosely sutured with one suture of fine plain catgut to the under surface of the pericranium which forms a part of the reflected soft part flaps. Three pieces of 0.2 inch iodoform gauze are "insinuated" in a concentric manner between the cortex and the dura, to wall off the subdural and subarachnoid spaces to prevent extension of infection. The ends of the three pieces of gauze should be left about 0.7 inch long, so that their removal at a later date can be accomplished more easily.

The abscess cavity is again entered with the exploring

cannula to verify the position of the abscess, and along the cannula a sharp pointed knife is inserted and an incision about 0.2 or 0.5 inch long is made through the brain substance overlying the abscess and the capsule, if one is present. The contents of the abscess cavity is then aspirated with a soft rubber catheter and syringe, so as to prevent gross soiling of the field of operation, after which the cavity is repeatedly filled with surgical solution of chlorinated soda and aspirated until the return fluid is fairly clear. The incision through the brain substance is then carried with a sharp knife to the limit of the abscess on one side, after which it is carried in a circular direction through the brain substance and capsule, if one is present, completely around the abscess. The overlying brain and capsule thus removed by the circular incision, are discarded, so that the abscess cavity is completely "unroofed." The cavity is then inspected and the remaining contents, if any, are removed by irrigation with surgical solution of chlorinated soda and gentle sponging. A complete "cleansing" of the cavity is more easily accomplished in encapsulated than in nonencapsulated abscesses. No exploration is made with the finger or instruments; it is not necessary as a thorough inspection can be made if the abscess is completely unroofed as advised; the capsule, if present, is not removed. During the inspection and cleansing of the abscess cavity, it will be observed that its depth will become more shallow, the remaining portion of the cavity less concave and the floor of the cavity appreciably rise; in other words, herniation tending toward eversion of the cavity will commence during the operation. In the light of past experience, this condition obviously predicts what should and what will take place.

No drainage tubes or other drainage materials are inserted into this remaining portion of the abscess cavity. A fenestrated rubber dam is placed over the cavity, over which small pieces of gauze soaked in surgical solu-

tion of chlorinated soda are placed. The original three pieces of iodoform gauze which were placed around the dural opening are not removed or changed. These pieces, during the procedure, adapt themselves into the margin of the subdural space and tend to prevent leakage into the subdural and subarachnoid spaces better than if they were changed and new ones introduced.

The intention of the procedure is, first, to remove the contents of the abscess cavity, and second, to remove the roof of the cavity so as to allow the remaining portion of the cavity to herniate outward through a cranial defect which is intentionally placed directly over the abscess. The rubber dam is used to protect the surface of the after-forming brain hernia; it offers better protection than gauze or any other substance which might be used, because there is no trauma to the hernia in its removal, and it allows irrigation with the solution of the shallowing abscess cavity on account of its being fenestrated. The rubber dam is then covered with a piece of gauze, moistened in a surgical solution of chlorinated soda; three perforated Dakin tubes are then placed over the gauze, so that afterward the entire area will be kept thoroughly wet with the solution, and a copious wet gauze dressing consisting of flats and head-roll is applied. Both ears are covered with several layers of petrolatum gauze to prevent irritation by the solution. If the abscess is frontal in location, it is advisable to cover one or both eyes with the gauze and include them in the dressing. Petrolatum gauze is not applied to the scalp surrounding the wound until the first dressing on the following day, as the scalp will withstand irrigation with the solution for 24 hours without irritation. The entire dressing is held in place with wet gauze bandages, including the head and the lower jaw, so as to prevent removal or displacement of the dressings by the patient.

This procedure is equally applicable for the treatment

of abscesses whether located in the frontal or temporosphenoidal lobes (with or without extension into the parietal or occipital lobes), or cerebellar regions, or for those abscesses which are secondary to an old infected depressed fracture or osteomyelitis. These groups form the greater majority of all brain abscesses. Likewise, single metastatic abscesses are amenable to this type of operation. For multiple metastatic abscesses, no surgical procedure can be expected to offer relief. If the abscess is located in the parietal lobe, necessitating a partial removal of the cortex, a monoplegia is to be preferred to a fatal result. In those cases of cerebellar abscess, where the abscess is situated on the anterior surface of the cerebellum, and the lateral sinus is involved, the approach described by Eagleton, with ligation and division of the lateral sinus, probably will give best results.

In the small remaining group of patients where the abscess is basilar in position, and no opportunity is offered for removing the wall of the abscess in order to allow the herniation, the two stage procedure described by Dowman is the operation of choice, if the abscess can be located.

In recapitulation, the procedure described in this paper is applicable for all cases of brain abscess, in which the "roof" of the abscess can be removed and the abscess cavity can herniate through the cranial defect. Fortunately, these cases are the more frequent and comprise the vast majority of all brain abscesses.

The postoperative treatment consists of instillation of surgical solution of chlorinated soda which should be done every two hours. Daily dressings should be made by the operator himself so that he will be thoroughly acquainted with the situation throughout. The first dressing is done on the first day following operation. All of the dressing, including the rubber dam overlying the cranial defect is removed. It will be observed that the floor of the abscess cavity will have reached the

level of the inner table of the skull. If not, this level will have been reached at the end of 48 hours.

At the first dressing and at the succeeding daily dressings, the scalp is covered with petrolatum gauze. Over the sight of the operation, including the scalp flaps, cranial defect, and so forth, the apparatus is placed, and fastened to the head with adhesive strips to prevent displacement. This constitutes the essential part of the dressing. The remainder consists of gauze and combines held loosely around the apparatus, without making compression, for the sole purpose of absorption of the used solution. The tube leading from the apparatus is connected with an irrigating bottle and the area is flushed every two hours. On the fifth or sixth day, the three iodoform gauze strips are removed from the margin of the cranial defect. By this time the danger of extension of infection into the meninges will have passed, as the area will have become well walled off. The apexes of the scalp flaps are released and are allowed to fall forward against lateral surfaces of the hernia, to which they will become attached in a few days. By the eighth or ninth day, the hernia will have reached its maximum size and the abscess cavity is completely everted, or "turned inside out."

The author's conclusions are:

1. Various operative procedures heretofore described, in which numerous kinds of drainage materials were used, have usually been followed by a high mortality rate.

2. In all of these procedures described, prevention of hernia cerebri has been desired.

3. In this paper, the operative technic and postoperative treatment embrace the following: Creation of a rather large cranial defect directly over abscess cavity; complete "unroofing" of the cavity; complete herniation or eversion of the cavity; irrigation of area with the solution using the apparatus devised for this purpose; prevention of trauma and early compression of

hernia cerebri; lumbar puncture, if necessary, after the first two weeks; recession of hernia; adhesive plaster strapping; epithelization.

4. Results: Four patients consecutively operated on in this manner have recovered; three of them with true brain abscess and one with traumatic brain abscess surrounding a retained foreign body. There was no mortality rate.

Cerebrospinal Fluid as Index of Otorhinogenic Intracranial Complications. This report by C. F. Yerger[1] is based on cases observed at the Cook County Hospital, consisting of 155 cases of meningitis, 43 cases of lateral sinus thrombosis, 35 cases of brain abscess, 8 cases of labyrinthitis, four cases of extradural abscess, two cases of cavernous sinus thrombosis, and one case of subdural abscess.

From the examination of the cerebrospinal fluid in these cases the author believes that the cerebrospinal fluid is a reliable index of some of the intracranial complications of otorhinogenic origin, such as meningitis, brain abscess, and subdural and extradural abscess in the vast majority of cases. It is of value not alone as an adjunct in the diagnosis of these cases but also in the prognosis and treatment. In order that the cerebrospinal fluid examination may be an accurate index of the intracranial pathologic changes present, the examinations should be performed in a scientific manner as regards the cytologic, chemical, serologic and bacteriologic determinations, and should be repeated as often as necessary. The information gained from an examination of the cerebrospinal fluid may be pathognomonic in some cases; in others it may be misleading and should not be relied on to the exclusion of other dependable clinical signs indicative of intracranial involvement. The knowledge obtained from examination of the cerebrospinal fluid may be of value either in a positive or a negative manner. A negative finding at once differ-

(1) Jour. Amer. Med. Ass'n., Aug. 8, 1925.

entiates a meningismus from a meningitis and it usually eliminates meningitis, brain abscess, subdural and extradural abscess. One negative finding of the cerebrospinal fluid in a case of threatened or manifest intracranial complication should not be considered final.

A sterile cerebropsinal fluid with a low cell count (from 25 to 250) excludes a suppurative meningitis, but throws suspicion on the presence of an extradural or brain abscess; in a medium cell count (from 250 to 2,500), one should suspect a subdural or brain abscess or meningitis; but, in the high (over 5,000) and very high (over 10,000) cell count a diffuse suppurative meningitis is usually present. The higher the cell count, the more certain the diagnosis of diffuse septic meningitis. A diffuse meningitis is considered clinically proved when bacteria are found in the cerebrospinal fluid.

In a circumscribed meningitis, serous or suppurative, of otorhinogenic origin, the cerebrospinal fluid returns to normal after the removal of the focus of suppuration as extra dural or brain abscess; but when the drainage is insufficient, it does not return to normal, and when complicated by an acute diffuse suppurative meningitis, there occurs a sudden and marked increase in the polymorphonuclear leukocytes, with or without the association of bacteria.

In every case of otorhinologic infection associated with the cerebrospinal fluid findings of a sterile serous meningitis or of a sterile suppurative meningitis, we must not overlook the following diagnostic possibilities: in the former group, the intracranial complications of otorhinologic origin such as meningitis, extradural, subdural or brain abscess, acute toxic meningo-encephalitis of otorhinogenic origin; tuberculous or syphilitic meningitis, poliomyelitis or epidemic encephalitis; and in the latter group the intracranial complications of otorhinogenic origin, as meningitis and brain abscess; or epidemic meningitis (meningococcic) and syphilitic meningitis.

Diffuse septic (bacterial) suppurative meningitis is associated with a high polymorphonuclear cell count plus the invading bacteria; it is frequently the sole otitic intracranial complication, but it may be associated with brain abscess or septic sinus thrombosis as a terminal complication.

After-Treatment of Opened Otogenous Brain Abscess. O. Körner[2] states that after the abscess has been opened, drainage of the pus is favored by a sitting position. The aperture in the meninges and brain cortex is kept open and if necessary dilated by insertion of an arterial clamp. The cavity is then inspected by carefully spreading the operative opening with a Killian speculum for the middle nasal meatus and by illumination with a forehead lamp. If necrotic shreds of brain are found they must be taken out with suitable pincers. It is better not to introduce other instruments into the cavity and palpation of the walls with the fingers is not permissible. Irrigation of the cavity is indispensable for complete removal of pus. Tearing of the ventricle wall by pressure of the water will not occur if the irrigator is held so low that the water only flows gently through the cavity. The author adds hydrogen peroxid to the irrigating water. He does not drain with gauze, as it is not capable of carrying the viscous pus through the comparatively small operative opening in the dura to the external dressing. The cavity is cleansed and dusted with boric acid and iodoform and left empty even when it has recesses.

The chief effort must be directed to procuring a harmless outlet that is always open for the pus that is excreted. This can be accomplished only by rigid tubes, and as a rule only by curved ones, for generally abscesses of the cerebrum are opened from below through the mastoid process and abscesses of the cerebellum, especially labyrinthogenic ones, from in front. Soft tubes cannot be kept curved, or they bend. Rigid

(2) Deutsche Med. Wchnschr., Jan. 16, 1925.

tubes involve danger only when they are improperly used.

In order to protect the abscess wall still more from injury by the end of the cannula the author uses Roser's trachectomy cannulas, which have a closed end in the form of a cupola with four lateral holes just under it. The cupola and the holes project free into the abscess cavity, and the closed end on being put in and taken out cannot irritate either the meninges or the cortical substance. After the cannula is taken out the abscess opening always remains open a strikingly long time, so that there is no retention of pus. The results with this after-treatment are excellent.

Intracranial Complications of Suppurative Otitis Media. This paper by C. F. Yerger[3] is based on a study of the intracranial complications of suppurative otitis media that were observed at Cook County Hospital during the decade from 1911 to 1920, inclusive. Meningitis was found to be the most frequent complication, occurring in 5 per cent. of the cases. Sigmoid sinus thrombosis was second in frequency, 34 cases (3 per cent.) being observed. Any case of suppurative otitis media developing a rigor or chilliness that cannot be explained by the presence of infection elsewhere (tonsollitis, erysipelas, pneumonia, malaria, pyelitis) should be suspected of being at least a presumptive case of sinus thrombosis. This becomes especially significant when the chill is followed by a high fever and sweat and there is associated mastoid tenderness or roentgenologic evidence of mastoid involvement. Diagnosis should be made before the occurrence of metastatic phenomena. The earlier the operation, the better the prognosis.

Brain abscess was found third in frequency, 23 cases (2 per cent.) being observed, 35 per cent. of which were of otitic origin; of the 18 patients operated on but one recovered, a mortality of nearly 95 per cent. The

(3) Illinois Med. Jour., October, 1924.

most important procedure in connection with the diagnosis of a suspected otitic intracranial complication is the examination of the cerebrospinal fluid. The treatment of brain abscess is operative, as soon as the diagnosis is made. The writer believes in a generous removal of bone, sufficient to obtain a good exposure of the dura and a relatively small opening in the dura because of the lessened liability of infecting the subarachnoid space and brain, and the avoidance of a subsequent hernia cerebri and fungus cerebri. Only eight cases (less than 1 per cent.) of spontaneous labyrinthine symptoms were observed. Treatment is a question of diagnosis. In the paralabyrinthitis cases a radical mastoid operation is indicated. If necrotic bone of the bony capsule of the labyrinth is found it should be removed, care being exercised that the intact membranous labyrinth is not disturbed.

Cerebellar Abscess. Of eight cases of cerebellar abscess observed by J. S. Fraser[4] only one followed acute middle ear suppuration, while the remaining seven resulted from chronic purulent otitis media. Six of the patients were males, and with one exception, all were under 30. There were four deaths. Of the seven chronic cases, two were due to scarlet fever and two to measles. Perisinus abscess and sinus thrombosis without labyrinthitis were present in three cases, labyrinthinitis in two, perisinus abscess without sinus thrombosis or labyrinthinitis in two, and extradural abscess in a triangular area in the posterior fossa, without sinus thrombosis or labyrinthitis, in one case. In at least three of the seven chronic cases symptoms of an intracranial complication had been present for two to three weeks before the patient was sent into the hospital.

Headache was a symptom in all cases, and in two was not only occipital but also frontal. In six of the eight cases earache was noted apart from the headache; in all vomiting was a prominent symptom. Of the seven

(4) British Med. Jour., Nov. 29, 1924.

chronic cases, drowsiness was marked in five; shivering or rigors were present in three; constipation was noted and the tongue was dry and furred in three; emaciation was marked in four. Blurring of the margins of the disk was noted in three cases, and well marked optic neuritis in two.

In only two cases when the patient was first seen was the temperature of the typical subnormal type, with slow pulse. In only two of the seven chronic cases did the patient complain of giddiness or loss of balancing on admission. Two patients had nystagmus to both sides, including the acute case. In one case nystagmus was directed to the side of the lesion. In two other cases nystagmus was present on the sound side, and in one of them it was also noted on looking upward. Tenderness on tapping over the cerebellar fossa on the affected side was noted in two cases. Sagging of the meatal wall was noted in three of the seven chronic cases.

In only four of the eight cases was the diagnosis of cerebellar abscess sufficiently certain at the time of the first operation to enable the author to proceed to the opening of the abscess. In the remaining four cases the collection of pus in the cerebellum was not evacuated until a second, or even a third, operation. In each of the seven chronic cases cholesteatoma was present. In four of them the mastoid was dense; in the remaining three the mastoid cortex was softened by disease.

The Internal Ear

Indications for Labyrinth Operations. R. Bárány[5] discusses the indications for opening the labyrinth as follows:

Suppurations of the Labyrinth Originating in the Middle Ear. With partial preservation of the labyrinthine function, the following groups of cases are established: (1) labyrinthine fistula without labyrinthitis;

(5) Acta oto-laryngol., 6:260, No. 3-4, 1924.

(2) fistula with circumscribed purulent labyrinthitis; (3) fistula with circumscribed serous labyrinthitis; (4) circumscribed purulent labyrinthitis without fistula, and (5) circumscribed serous labyrinthitis without fistula. In this whole class, the labyrinth has to be operated upon only in rare cases. Serous labyrinthitis may be caused by the invasion of toxins, of bacteria of low virulence, or of a very few virulent bacteria. Cases of Group 1 are observed only in cholesteatoma with intact tympanic membrane and intact ossicles. Cases of Groups 2 and 3 occur in tuberculosis, cholesteatoma, subacute and chronic otitis media, and in injuries of the labyrinth. Tuberculous labyrinthitis is usually of serous character, so that expectant treatment is permissible, unless intracranial symptoms develop. In cases originating in cholesteatoma and subacute and chronic otitis media, immediate opening of the mastoid with the chisel is indicated, followed by radical operation, unless the middle ear can be adequately drained through the auditory meatus. Great care must be taken not to touch the fistula during this operation. If external injuries are complicated by infection of the middle ear and followed by progressive functional elimination of the labyrinth, the latter has to be opened. Where the tympanic membrane is intact, this can often be done at the back of it without any lesion to the membranous canal. If the labyrinthitis originates in operative injuries of the semicircular canals or of the stapes, the prognosis is much more favorable in the former case (no matter how alarming the immediate phenomena) than in the latter. If the stapes has been accidentally extracted altogether, and the fistula test is positive, the vestibule should be opened by introducing one of the very small, but strong and sharp spoons devised by the author through the fenestra ovalis and by breaking open the promontory from inside outward. Cases of Groups 4 and 5 occur in tuberculosis, scarlatina, measles and otitis of ordinary etiology. In such cases, adequate paracen-

tesis is usually sufficient; but where drainage is hampered by swelling of the tympanic membrane, the author agrees with Dan Mackenzie in advocating early antrotomy, unless contraindicated by the general condition.

With total elimination of the labyrinthine function, the following groups of cases are differentiated: (1) acute diffuse purulent labyrinthitis with fistula; (2) acute diffuse serous labyrinthitis with fistula; (3) acute diffuse purulent labyrinthitis without fistula; (4) acute diffuse serous labyrinthitis without fistula; (5) subacute diffuse serous labyrinthitis without fistula; (6) subacute diffuse serous labyrinthitis with fistula; (7) subacute diffuse purulent labyrinthitis without fistula; (8) subacute diffuse serous labyrinthitis without fistula; (9) latent purulent labyrinthitis with fistula; (10) latent purulent labyrinthitis without fistula; (11) necrosis of the labyrinth; (12) healed diffuse purulent labyrinthitis and (13) healed diffuse serous labyrinthitis. If cases of this class occur in tuberculosis, scarlatina, or acute otitis of ordinary etiology, expectant treatment is permissible in the absence of intracranial symptoms, with repeated examinations of the spinal fluid. But in cholesteatoma and in chronic or subacute otitis media, where the labyrinthitis is usually purulent, the labyrinth operation should be performed together with the radical operation, immediate interference being indicated where retention of the secretion is apprehended. Jansen-Neumann's operation is indicated only where the bone around the labyrinth is diseased and especially in the presence of a deep extradural abscess. Otherwise, Hinsberg-Bourguet's method is generally sufficient. Sequestrums should be removed, if this can be done without danger of life.

Intracranial Suppurations Involving the Labyrinth. The author suggests that improvement might be effected in cases of total deafness resulting from epidemic cerebrospinal meningitis by extracting the stapes and enlarging the fenestra ovalis.

Nonpurulent Affections of the Labyrinth. The author regards labyrinthine operation as indicated in the presence of severe attacks of vertigo and deafness, but only after the failure of medical treatment, lumbar puncture, and exposure of the dura of the posterior cranial fossa (after his own method).

Tumors of the Acusticus and Cerebellum. The author doubts whether the translabyrinthine operation can compete with Cushing's method (intracapsular morcellation). At any rate, it would have to be rendered aseptic by isolating the drum from the antrum (as in Bárány's cranial fossa operation). The two methods may be combined, as has already been tried by several authorities.

Otosclerosis. The author gives a brief account of his progress with a method which has occupied him since 1910, and which seems preferable to Holmgren's method (opening of the promontory), because asepsis can be insured. He hopes that, by making use of the microscope and instrument described by Holmgren for opening the semicircular canals, he may succeed in perfecting this method so as to achieve permanent improvement of hearing in otosclerosis.

Some Remarks on Labyrinthine Surgery. A conservative attitude on surgery of the labyrinth is advised by E. B. Dench.[6] The cases may be divided into several groups: (1) fistula of the horizontal semicircular canal, presenting no symptoms, (2) dead labyrinth with no symptoms, (3) acute invasion of the labyrinth, accompanied by well defined headache and vertigo, that is, acute suppurative labyrinthitis, (4) where the invasion of the labyrinth is simply the first stage of an attack upon the intracranial structures, leading to either meningitis or brain abscess, and (5) accidental removal of the stapes during the process of a radical operation.

The author records twenty cases of labyrinthine

(6) Laryngoscope, August, 1925.

invasion in which the records are fairly complete. Seven were cured, and thirteen died. In all of the thirteen fatal cases, meningitis was present at the time of the labyrinthine operation, and the labyrinthine operation was simply undertaken to drain the subdural space through the area triangularis.

It may be said as a result of analysis of these cases, that as the seven cures were cases of uncomplicated labyrinthitis, that prompt operative interference at the occurrence of acute labyrinthine symptoms offers an excellent prospect of recovery, but that delay in the presence of labyrinthine symptoms is bad surgery.

A dead labyrinth without symptoms need not necessarily be removed. In fact, in the absence of symptoms it is inadvisable to interfere with the labyrinth. The presence of a labyrinthine fistula which gives rise to no symptoms and is only recognized at the time of a radical operation is no indication for a labyrinthine extirpation. Accidental opening of the oval window is not necessarily followed by meningitis, and if the oval window is packed off at the time of operation meningitis will probably not follow. The removal of the labyrinthine in cases of meningitis has proved extremely unsatisfactory, and while in the absence of any better procedure at present, the operation should be performed, the author cannot say from his own experience that it has been of material benefit.

Circumscribed Labyrinthitis. This is a study of 88 patients with fistula symptom in the Neumann clinic. E. Schlander[7] states that the principal locations of fistula are the outer wall of the horizontal canal and the promontory. The former are much more frequent because connective tissue protection between the bony wall and membranous labyrinth is greater, whether erosion takes place by granulating osteitis or by pressure of cholesteatoma. These patients were noted in which fistula symptoms developed some weeks after

(7) Ztschr. f. Hals—, Nasen— u. Ohrenhlk., Nov. 8, 1924.

radical operation, which had evoked no immediate disturbance. These are supposedly due to interference with blood supply by removal of the mucoperiosteum during the operation.

When present, spontaneous nystagmus is usually rotary and toward the diseased ear, and tends to diminish, while the nystagmus of retrolabyrinthine origin is stationary or increases, but exceptions are noted. Undulatory nystagmus is described by a number of authors as occurring, also nystagmus synchronous with the pulse. The latter is explained by the systolic filling and subsequent emptying of hyperemic inflammatory tissue causing endolymph movement.

Sixty cases were typical, thirteen atypical, two vertical, four changeable; three patients had no nystagmus but vertigo and pastpointing; one was typical head nystagmus. The atypical cases are supposedly due (Ewald) to location of the fistula at the promontory or the oval window. One, reported by Ruttin, was in such a peculiar direction in the external canal that the usual endolymph movement would be reversed.

If the ear is unhealed, the fistula symptom may persist for years; six of the patients developed diffuse labyrinthitis; of the five operated on, three died. A number of patients improved greatly in hearing and six somewhat; 28 remained stationary, and seventeen became deaf.

Treatment: In acute cases, especially if due to capsulated cocci, immediate operation is advised. In chronically ill patients with fair hearing and good drainage, free of granulations, labyrinth function present, the author recommends conservative handling. If the labyrinth process is progressive the author advises radical operation; likewise if the canal is narrowed by either bony changes or polyps causing retention, and certainly in the presence of any intracranial symptoms. In postoperative generalized labyrinthitis operation is performed on patients with a suppurative con-

dition, but not on those with a serious inflammation. In the patients with fistula symptom but no other evidence of function, if the radical mastoid operation discloses definite lesion of the labyrinth wall, the labyrinth operation is also immediately performed.

Study of the Transmission of Sounds to the Labyrinth. F. Pedrarzini[8] states that from a physical point of view the internal ear may be considered as constituted by an elastic sac filled with fluid which is contained in a rigid box, and in order that the labyrinth may discharge its function it is necessary that the elastic deformations of the membrane of the fenestra ovalis be compensated by a corresponding but opposite deformation of the fenestra rotunda taking place as the result of an impulse transmitted by the perilymph. If this correlation between the function of the two windows is disturbed (as for instance when the stapes is ankylosed) the auditory function is more or less wholly suppressed. The two windows are therefore equally important for hearing.

Most physiologists still believe that sound vibrations are transmitted to the fenestra ovalis by the tympanum and the chain of ossicles. Nevertheless, as Bonain recently pointed out, the fact that satisfactory hearing may be preserved in the absence of tympanum and ossicles proves that these organs are not essential for the auditory function. It is hardly conceivable, besides, if their function were merely the transmission of sounds, that such a complicated apparatus would be needed.

A close study of the possible movements of the bones and of their muscles, and of the innervation of the latter, clearly shows that the function of this apparatus must be chiefly to regulate the tension of the tympanum in accordance with the sound vibrations which strike it, and to deaden the oscillations of the labyrinth when they might be otherwise excessive. Through this appa-

(8) Presse méd., Dec. 10, 1924.

ratus the delicate elements of the labyrinth are protected both against excessive sound vibrations and against the counterpressure serving to moderate these vibrations.

What can be Heard without a Cochlea and Problem of Determining Monaural Deafness. That individuals who have lost the entire cochlea of one ear still retain a certain amount of hearing in that ear, is claimed by George E. Shambaugh[9]. His findings in one case are reported and he offers the following conclusions:

The conclusion from these observations seems to be that without the cochlea, that is, without the labyrinth, one may still possess some hearing, particularly in the upper tone ranges. The alternative would be that our methods of excluding the opposite hearing ear are at fault. This, at first thought, would appear to one as the more probable, and yet the evidence of the tests themselves seem to point altogether to the first conclusion. This conclusion is, moreover, borne out by the common clinical observation that in monaural defects in hearing due to degeneration of the eighth nerve, with the meatus of the normal hearing ear closed, there is no perception of the Edelmann-Galton whistle until we reach 20 or even 25, and this, too, in cases where the hearing for the lower tone range is scarcely affected. It would seem that there is a difference between the defect in hearing due to a destruction of the labyrinth and that due to a degeneration of the nerve itself, and that after the loss of the labyrinth alone there may still be a considerable remnant of hearing for the upper tone range which is not found in cases of degeneration of the nerve.

The tests which in this patient indicated the preservation of some remnants of hearing after the sequestration of the cochlea might be summarized as follows:

1. The c-2, c-3 and c-4 forks were all heard before

(9) Arch. Otolaryngol., March, 1925.

the meatus of the affected ear with the opposite ear closed.

2. The c-4 fork was heard distinctly when brought before the meatus after it ceased to be heard when held a short distance above the affected ear.

3. With the normal ear muffled by the noise apparatus, the c-4 fork was still distinctly heard when held before the affected ear, but was not heard when held a short distance above the ear or even near the opposite normal ear.

4. Removing obstruction to the normal ear the moment the hearing for the c-4 fork, held before the affected ear, had ceased, failed to bring a return of perception which should occur if the tone was actually being heard in the normal ear.

5. The perception for the Edelmann-Galton whistle with the normal ear closed began at 7; with the hearing in the normal ear mufflled with the noise apparatus, it began at 9. Both of these results point to perception in the affected ear, since it is a common clinical experience in other cases of monaural deafness in which the diagnosis is that of degeneration of the eighth nerve, to find little or no hearing throughout the entire range of the Edelmann-Galton whistle in the affected ear, even when the perception at the lower end of the tone range may be normal.

Dysfunction of the Cochlear Nerve and Ductless Glands. Clinical studies of the relation of the dysfunction of the cochlear nerve to the dysfunction of the ductless glands were made by John Guttman[1].

In order to investigate this much debated and quite obscure relation which may exist between the cochlear nerve and the ductless glands, the writer examined patients sent to an endocrine clinic for a possible ear affection instead of examining patients of an ear clinic for a possible endocrine affection. Fifty patients were examined and the following facts seem to point towards

(1) Ann. Otol., Rhinol., and Laryngol., March, 1925.

a possible relation between the cochlear dysfunction and endocrine disturbance:

1. Out of the 50 patients suffering chiefly from an endocrine or other systemic affection, a high percentage (64.2 per cent.) were found to be suffering also from some form of diminished hearing power. In this connection the charts obtained by the use of the electric acumeter have great illustrative value.

2. The fact that certain forms of deafness often become aggravated during puberty, gravidity, puerperium, climacterium, and so forth where the ductless glands seem to play an important role.

3. Deafness is often encountered in cretinism, which is also the result of an endocrine disturbance.

4. Improved hearing following adenectomy may be the result of the removal of the pharyngeal hypophysis.

5. The above named three types of ear affections, as dry middle ear catarrh, otosclerosis and progressive nerve deafness, may in a great number of cases be considered as one, and if clinical and laboratory examinations point towards some endocrine involvement, they must be designated as idiopathic deafness of endocrine origin.

6. In the functional examination of the ear, if no other constitutional cause can be found, diminished bone conduction is suggestive of idiopathic deafness of endocrine origin. According to the figures above, 52 per cent. of the patients frequenting an endocrine clinic, and referred for ear examination, showed diminished bone conduction.

Rinné negative and prolonged bone conduction may mean only an advanced stage of the disease where stapes ankylosis has already set in.

7. Idiopathic deafness of endocrine origin may be considered as an affection of the sound perceiving apparatus, and may be differentiated from progressive nerve deafness by the fact that its etiologic cause is

some endocrine dysfunction. In many of these cases there was a tone scale also, as the appended graphs clearly show.

8. In idiopathic deafness of endocrine origin, as in many endocrinopathies and nerve disorders, heredity is an important factor.

9. The treatment, as in other nerve affections, must, for the present, consist in constitutional treatment, rest, proper surroundings, proper diet, and so forth. In the early stages some medical or endocrine treatment may be of some value.

10. Even though the patient does not complain of any ear affection, the endocrinologist may utilize the functional examination of the cochlear nerve for differential diagnostic purposes similarly to the manner in which he utilizes the changes in the field of vision or the optic nerve.

Miscellaneous Conditions

The Anatomy of the Emissary Vein. A contribution to the anatomy of the emissary vein is made by Arthur Cheatle[2]. In most of the 1500 skulls he had examined the emissary vein was single and small, originating on the outer edge of the lateral sinus groove, just below the bend, and having a short course in the substance of the bone, in an upward and backward direction, and opening on the surface just behind the upper posterior edge of the base of the mastoid. A branch of the occipital artery passed through the same canal. It was not uncommon for this vein to be absent, nor for it to be unilateral. Its diameter might be that of a mere thread, that of a wax match, or it might be one-quarter, three-eighths, or half an inch. Where it was over one-eighth of an inch in diameter it must increase in size of the external jugular vein. The emissary vein might be simple at its origin and double at its exit; or dou-

(2) Lancet, May 9, 1925.

ble at both origin and exit; or double at origin with three points of exit. The vein was always in the substance of the bone; the canal was never surrounded by cells nor running freely across them. The length of its course might be one-sixteenth to three-quarters of an inch, and its exit might be low down in the digastric fossa, or even entirely behind it. In the lower animals it was frequently associated with the petrosquamosal sinus, but only in the human when it was very large. In the large series of skulls examined there were two only in which the lateral sinus came to an abrupt end, emerging through an enormous mastoid foramen, with complete absence of the lower part of the lateral sinus.

There is a risk of opening this vein at its exit in making incisions, or in stripping up periosteum in various operative procedures; also in the treatment of lateral sinus thrombosis, or cerebellar abscess, and in doing decompression. Usually, bleeding from it is trivial, and can be easily controlled, but in cases where the vein is of large size wounding of it may be dangerous. In those instances he suggests the use of a muscle plug. The vein may constitute a channel for the conveyance of septic thrombosis, and it may be infected from the lateral sinus, which, indeed, is inevitable when the vein is very large. Or this sinus may be secondarily infected after operation for mastoiditis. Sepsis can spread from this vein to the diploe, causing local inflammatory signs in unexpected parts of the skull. If the sepsis extends down the occipital and external jugular veins it becomes necessary to ligature and excise the external jugular.

Histologic Findings in the Petrous Bone in Gunshot Wounds of the Skull. The Problems of Concussion Deafness. The histologic findings in the petrous bone of six cases is reported by W. Uffenorde.[3] All were severe cases, complicated by cerebral involvement and

(3) Ztschr. f. Hals—, Nasen—, u. Ohrenhlk., Oct. 15, 1924.

primary or secondary infection—all in the form of basal meningitis, which is characteristic of such injuries. A striking feature, which does not fit in with current views, was the fact that in all except two cases the tympanic membrane was intact; a rupture did not ensue even with fracture of the posterior or anterior wall of the auditory meatus. Four cases showed the definite picture of hematotympanum, which was also clinically demonstrable in two cases. Deposits of blood on the tympanic membrane and the walls of the auditory meatus could be repeatedly seen, although a solution of continuity in the membrane or in the skin of the auditory meatus was not (or no longer) demonstrable. As his chief finding the author cites fissures or fractures in the tympanic walls, sometimes in all portions of the wall, and often also in the walls of the labyrinth and cochlea in all cases in which the petrous bone was immediately involved. Almost invariably such a fracture was recognizable by histologic examination only; in one case it was found at operation, and in another (macroscopically) at autopsy. This indicates that clinical observation alone is insufficient and that extreme caution is required, especially in making a negative decision.

Another finding in almost all cases was hemorrhage into the tympanum and internal ear; this occurs in the cochlea and especially in the internal meatus, even more regularly than in the labyrinth spaces. It raises a question as to concussion deafness in gunshot injuries of the skull. Much objection has been advanced against the idea of concussion, the strongest opposition being that of Ulrich who, on the basis of examinations of injuries of the auditory organ in basal fracture of the skull, insists that anatomic findings and clinical symptoms agree completely and that, therefore, the hypothesis of concussion is wholly superfluous. Among others, Hinsberg and Voss have pointed to the possibility of hydrodynamic pressure explosion effect. The author believes

that this is primarily responsible in indirect influences upon the ear. Such a hydrodynamic distance effect need not necessarily be limited to the tegmen or roof of the tube; the labyrinth and the bone of the cochlea also show these isolated delicate fissures, which usually can be demonstrated microscopically.

If this applies to injuries of the bone, it is still more true of the soft parts, especially blood-vessels and nerve-endings. We must probably reckon with such hydrodynamic pressure effects not only in penetrating gunshot wounds, but also in glancing, segmental, bursting and lodged wounds, as the author's cases show. The author's findings of hemorrhage in the internal auditory meatus and in the middle and internal ear, of fissures and clefts, and of lacerations of the nerves, are so definite that the rather vague conception of concussion must be relegated. Further tests alone will show whether and to what extent concussion also plays a part.

Report of the Committee on the Problems of the Hard of Hearing, Section on Laryngology, Otology, and Rhinology. The committee, consisting of H. Hays, H. Newhart, N. Pierce, W. Phillips, and G. Shambaugh,[4] sent a questionnaire to 1,000 members, eliciting 150 replies. The majority of these were in agreement on the following points: (1) The most important etiologic factors producing deafness are nose and throat conditions that directly affect the eustachian tube. Heredity is believed to play no part except in deaf mutism and syphilis. (2) Deafness is decreasing because more attention is being paid to nose and throat conditions in childhood. (3) Otosclerosis is comparatively rare; nerve deafness is rare except in syphilis and meningitis. (4) Roentgen treatment is absolutely without value, except so far as it affects the lymphatic tissue in the nasopharynx. Mechanotherapeutics or electrotherapeutics produce no beneficial results, although some forms of vibration are of temporary benefit. (5) Ethical spe-

(4) Jour. Amer. Med. Ass'n., Dec. 27, 1924.

cialists urge deaf patients to wear suitable hearing devices, to stay away from quacks, and to learn lip reading.

A Study of the Eustachian Tube, with Special Reference to the Recognition and Preservation of Its Delicate Functions in the Ventilation of the Middle Ear. Middle ear deafness, of which there are ten cases to one of all other causes combined, can be cured in the incipient stage by attending to the ventilation of the eustachian tube. Most patients apply too late; but the early subjective history invariably indicates that the condition began with disturbed ventilation, the result of inflammation at the proximal end of the tube, caused by the excursion of pathogenic bacteria beyond normal limits. F. E. Brown[5] suggests that in the presence of normal ventilation the bacteria entering the tube are deposited near its orifice (on account of the slow character of the air changes) and kept within physiologic bounds by the ciliary action of the epithelium. Apart from this, the tube serves to maintain a pressure not higher than one atmosphere inside the cavity composed of eustachian tube, middle ear and mastoid antrum, which is indispensable for the health of every tissue involved. This being so, it may be supposed that in disease bacteria are more likely to be expelled and tissue health to be restored if the ventilation of the cavity is approximated to normal conditions.

The flow of air on opening the eustachian orifice is generally regulated by the lower density inside the cavity, due to the circumstance that the inside air has a higher temperature and is subject to absorption by the mucous membrane. But by violently forcing air up the tube, as has been advised and practiced, while holding the nose, or with the Politzer bag, foreign substance laden with bacteria is apt to be forced in with the air.

The author discovered that air could be drawn down and out of the tube by swallowing while closing the nose

(5) Northwest Med., January, 1925.

repeated several times and followed by swallowing with the nose open, to relieve the resulting tympanic tension. It was definitely established by Rich of Johns Hopkins in 1920 by vivisection on the living dog that the pressure equilibrium is maintained or rather restored by deglutition, performed when necessary either consciously or through habit, but never set in motion by direct reflex stimulation. Brown has found the swallowing procedure (combined with eating small pieces of ice, where necessary, to relieve pharyngeal congestion) of great prognostic and therapeutic value, both at the first sitting and after the removal of nose and throat disabilities. In many cases, especially in children, paracentesis was rendered unnecessary thereby. It also proved useful in drainage cases (with a perforate membrane) for producing mild suction toward the throat.

Artificial Interruption of Pregnancy on Account of Otosclerosis. Although the adverse influence of pregnancy on existing otosclerosis is generally recognized, and although several authorities have expressed themselves in favor of interdicting marriage or preventing conception, only two or three cases of interruption of pregnancy for that reason have been reported. According to H. Burger,[6] Blöhmke, who cites these (1918), discusses the ethical question; he rejects interruption of pregnancy for otosclerosis because he is of the opinion that the conditions stipulated by the scientific committee which discussed the question in 1916—danger to life and health—are not fulfilled. The question is difficult. On the one hand, deafness may become complete and the resulting tinnitus may become so intolerable that numerous patients have developed neurasthenia and more than one have attempted suicide; on the other hand, if pregnancy is interrupted, conception must also be made impossible for the future and the consequences of this are equally incalculable.

The author had to decide regarding this problem in

(6) Acta Otolaryngol., No. 2, 1925.

the case of a woman who was in her first pregnancy after being married three years. Local treatment was bound to be futile in view of the dominating factor of heredity. As the patient declared that music constituted her main interest in life, whereas the absence of children would not make her particularly unhappy, and as her husband assented, the operation was performed. Two months later, the right ear, which was principally affected, could hear the whispered voice at 100 cm. (previously only at 40 cm.), and the tinnitus was much less constant and troublesome. After another seven months, the distance could be increased to 120 cm. and the tinnitus had become negligible.

Stages and Phenomena of Sexual Development in their Influence on Otosclerosis. C. Stein[7] investigated the sex life in 125 otosclerosis patients, 68 per cent. of whom were women.

The disease began at puberty in 27.1 per cent. of the patients. Abnormal menstruation was noted in 36.5 per cent. of the women. The progress was more rapid than in the patients with normal menstruation. The prognosis is especially bad in patients with dysgenital constitution, combined with anomalies of the nervous system and of the circulatory apparatus. The unfavorable influence of pregnancy is extremely frequent, although not constant. Sexual hypofunction and hyperfunction were common. Unsatisfactory sex life, especially coitus interruptus, were given by the patients as causes of impaired hearing and especially of subjective troubles. One man with psychic impotence was successfully treated by psychanalysis. At the same time the subjective acoustic disturbances improved. The author found many other abnormalities in his otosclerosis patients. This "status degenerative" occurs in various combinations, including osteopsathyrosis and blue scleras, none of which is characteristic for otosclerosis. The sex life of otosclerosis patients and their descend-

(7) Wien. klin. Wchnschr., Jan. 22, 1925.

ants should be studied and directed carefully. The only therapy which has been done so far in this line was prohibition of pregnancy. Frey found that psychic injuries are also important. Roentgen treatment, calcium and even psychanalysis may be of value.

Treatment of Vertigo. According to A. Ramsbottom[8] equilibruim is said to be controlled by a center situated in the cerebellum. Afferent impulses come from the skin, muscles, joints, eyes and labyrinths. The afferent impulses travel through the superior cerebellar peduncles to the red nucleus, and from the red nucleus to the lower motor neurons. As the most important afferent impulses are those from the labyrinths, vertigo cases are classified into: Those associated with aural disease; those in which no aural disease is discoverable. Group 1: In all these, vertigo is due to disturbance of the labyrinth. It may be an irritative lesion of the external canal or middle ear. It may be an actual nonsuppurative destruction in the internal ear, nature not known, or it may be suppuration in the internal ear. With paroxysmal vertigo the author considers Ménière's syndrome.

Where there is suppuration, surgical interference is indicated. In the nonsuppurative lesions the treatment is to care for all details of general health. The drugs suggested are iodids, bromids, strychnin, and quinin and the author finds quinin the most valuable in warding off an attack of vertigo.

Group 2: These are disturbances of the afferent impulses from sources other than the labyrinths. Errors of refraction are common causes of vertigo and their correction cures it. Neurotic vertigo is usually in neurasthenics. The treatment is that of the neurasthenia. In migraine errors of refraction should be looked for. Quinin is beneficial in these cases but phenobarbital may be necessary. Vertigo due to organic disease of the central nervous system is very difficult to relieve.

(8) Lancet, Dec. 6, 1924.

When vertigo occurs in anemia and gastro-intestinal disorders, it is probably due to toxins and is relieved by giving calomel. The commonest causes of vertigo in this group are the circulatory disturbances. The treatment will be that of high blood pressure on the one hand or low blood pressure on the other. The iodids are beneficial in both types.

Nystagmus. Nystagmus of otitic origin is defined by I. Leon Meyers[9] as a phenomenon consisting of a series of rhythmic, biphasic movements of the eyes, the eyes in the first phase deviating from their position of rest or fixation and in the second phase returning to (or near) their original position. The movement in the first phase is carried out slowly and is, accordingly, designated as the slow component; that of the second phase is rapid and jerky in character, and is known as the quick component. The latter being the more conspicuous of the two phases is the one that is employed to indicate the direction of the nystagmus, so that the term "nystagmus to the right" indicates a primary deviation of the eyes to the left which is followed by a return jerk to the right.

In an effort to determine the relation between the slow and the quick component, Meyer carried out a series of neuro-otologic studies in cases of apoplexy with hemiplegia which has as one of their symptoms conjugate deviation of the head and eyes or of the eyes alone.

In cerebral hemiplegia of vascular origin during the period of conjugate deviation of the eyes to the side of the lesion, it appears to be impossible to evoke nystagmus to the side opposite to the lesion. Labyrinthine stimulation of a character which evokes this reaction to the corresponding side in a normal person produces instead, provided the patient is not deeply unconscious, a persisting and frequently intensified conjugate deviation of the eye to the side of the lesion.

(9) Amer. Jour. Med. Sc., May, 1925.

The substitution in this condition of nystagmus by conjugate deviation of the eye to the side of the lesion, or merely an impairment of the nystagmus, may outlast by months the conjugate deviation of the eyes which as an initial phenomena was brought about directly by the cerebral lesion, a fact to be remembered in evaluating the atypical nystagmus resulting from stimulation of the labyrinth in patients with a recent hemiplegia.

The motor impulse for the rapid phase of nystagmus originates in the cerebrum. The fact that it was found to be abolished by lesions which gave rise to hemiplegia with pure motor aphasia, and no phenomena referable to the sensory cortex or optic thalamus, makes it highly probable that it has its origin in the laterogyric center of the eyes, which is situated, in accordance with the researches of Beevor and Horsley, in the middle and inferior frontal convolutions, in an area adjacent to the speech center of Broca. The corpus striatum undoubtedly plays a part in the production of this phenomenon. In a case previously reported and in which microscopic study of the brain showed degeneration of the globus pallidus and no lesions of the motor cortex, pyramidal tracts, optic thalamus, midbrain or pons, labyrinthine stimulation produced a nystagmus which was normal in direction and amplitude but greatly lessened in duration, the eyes showing a tendency to persist in the primary phase of the nystagmus—the conjugate deviation.

The motor impulse for the slow phase of nystagmus originates, most probably, in the nuclei of the eye muscles in the midbrain and pons. It may be produced by appropriate stimulation of the labyrinth to either side, regardless of the cerebral lesion. It appears highly probable, however, that his phase is to some extent also influenced by cerebral activity.

Abnormal Ear Conditions in Patients with Mental Diseases. Patients with such conditions in the Dan-

ville, Pa., State Hospital have been studied by G. B. M. Free.[1] One of the legacies from ancient mental medicine is the so-called "insane ear" or hematoma auris. As generally understood, the condition consists of a hemorrhage or effusion of blood between the cartilage and the perichondrium, with subsequent enlargement and thickening or a crumpled deformity of the auricle. Earlier writers considered its origin spontaneous and due to trophic changes is the tissues of the insane patients. Some observers attach definite prognostic value to this phenomenon.

After more than twenty years of observation of patients with mental defects in the Danville State Hospital, and after following many thousands of these patients from the time of admission to the date of discharge or death, Free is convinced from investigations made in individual patients immediately succeeding the appearance of the condition that hematoma auris, "insane ear" or cauliflower ear is of neither diagnostic nor prognostic significance. These conditions invariably result from trauma inflicted by the patient himself or by others. When one considers the large number of patients who, because of auditory hallucinations, are given to continual self-mutilation, day after day inflicting injury to the external ear by beating it with their fists in order to drive away the imaginary persons who are talking to them, it is surprising that hematoma auris occurs so seldom.

Examination of 1,000 patients, including those of all types and in all stages of mental disease, made as a routine, with no attempt at selection, has revealed that 160, or 1.6 per cent., have suffered in one or both ears from impacted cerumen necessitating mechanical removal. Eighty-seven of this series of 1,000 had both ears impacted: 28, the right ear and 48, the left ear. The increased frequency in the left ear, nearly double of that in the right when but one ear is involved, is un-

(1) Arch. Otolaryngol., May, 1925.

doubtedly due to the lessened dexterity of the left hand in removing the wax in the formative state of impaction.

The frequency of impacted cerumen in insane patients, in a large degree, is due to the diminution and blunting of the pain sense, the formation of the impaction itself often resulting from foreign bodies introduced by the patient and serving as a nucleus for the development of the mass. It is likewise well known that the epileptic patient shows not only intellectual deterioration, but also a general sluggishness and dulling of cutaneous sensibility. It is not surprising, therefore, that this condition has been found more frequently in the epileptic group; in fact, nearly 25 per cent. of the 74 female epileptic patients in this group of 1,000 patients showed the condition on first examination, and this group had the largest number of recurrences on reëxamination two years later.

It is well known that patients with mental disease who suffer from auditory hallucinations on which may be engrafted delusions of various type and character, invariably react to those abnormal manifestations by attempting to protect themselves and to do away with their unpleasant experiences. In other words, a patient who suffers from tinnitus, which he may interpret as the chirping of crickets, escaping steam, gases or electricity being forced into his head, or the person who hears imaginary voices which seem to come to him by radio, by electric wires, or from people standing outside his room or beneath his window who continually call him vile names or plot against him, will most naturally attempt to rid himself of the supposed cause of those disturbing and tormenting sounds. Some weeks before his commitment, a patient now in the Danville State Hospital went to the surgeon at the Scranton Hospital and insisted on an opening being made back of his ear to remove the crickets which he claimed were incessantly chirping in his ears. For some years, he continued to request the operation. Ex-

amination at the time of admission revealed chronic disease of the middle ear.

The most common approach to the solution of the problem is, as has been noted in the foregoing, in connection with hematoma, the beating of the head and ears to drive away the persecutors, or of filling the auditory canal with all types of foreign material to shut out the sounds. It is interesting to note what has been found in many patients with hallucinations during the routine examination of 1,000. The articles most commonly found are wads of paper, which are inserted in small balls, one after the other, until the canal is compactly and firmly filled. Bits of rags are almost as common. In one case, Free found the canal filled with hair pulled from the patient's head and inserted bits at a time. Another had both ears filled with brown cockroaches. In another patient, a large, well preserved black beetle was found. One patient inserts particles of coal in the canal; another, pieces of wood, and others, pieces of softened soap which, when hardened, becomes difficult to extract. The author states his conclusions:

1. Congenital and acquired abnormalities of the external ears are, of themselves, without significance in the diagnosis of mental disease or mental defect, and the latter (hematoma) should be considered as traumatic in origin and without prognostic import.

2. Diseases of the ear should be considered as a definite etiologic factor in the production of certain types of abnormal mental manifestations.

3. The patient with mental defect frequently suffers from ear conditions which are self-produced as a reactive measure to his disturbing mental experiences.

4. Routine examinations of the ear should be made in all patients with mental disease. Such examinations, in many instances, will reveal conditions which, if removed, will at least render the patient more comfortable, and in some cases will bring about a cessation of the mental symptoms.

The Nose and Throat

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THE NOSE AND THROAT

General Considerations

Progress in American Otolaryngology. In January of this year the American Board of Otolaryngology was formed. According to H. W. Loeb,[1] the secretary, the chief activities of the board are as follows:

1. To establish standards of fitness to practice Otolaryngology.

2. To investigate and prepare lists of medical schools, hospitals and private instructors recognized as competent to give the required training in Otolaryngology.

3. To arrange, control and conduct examinations to test the qualifications of those who desire to practice Otolaryngology and to confer a certificate upon those who meet the established standards.

These activities proceed from the object of the Corporation, which is stated in the Articles of Incorporation to be:

"The object of the corporation shall be to elevate the standard of Otolaryngology, to familiarize the public with its aims and ideals, to protect the public against irresponsible and unqualified practitioners, to receive applications for examination in Otolaryngology, to conduct examinations of such applicants, to issue certificates of qualification in Otolaryngology and to perform such duties as will advance the cause of Otolaryngology."

(1) Am. Otol., Rhinol., and Laryngol., March, 1925.

The Board has already received more than three hundred applications.

In determining the question of certification, the examiners rely on the following criteria:

1. The applicant's professional record.

2. Written reports of the prescribed number of cases that he has observed and treated.

3. A practical, clinical, and laboratory examination, when required.

4. A written examination, when required.

The policy of the Board at present is to place chief emphasis on the ability to draw correct inferences and make intelligent use of reports from pathologists, rather than an ability personally to carry out all laboratory manipulations and examinations.

Something of the latter will be required of the most recent graduates, who may be asked to examine specimens, identify tissues and micro-organisms, and interpret pathologic conditions. As the teaching of Otolaryngology improves, more of this practical laboratory work will be required, including work in anatomy, physiology, bacteriology and pathology.

The written examination is intended to cover such of the underlying principles or science of Otolaryngology as cannot be covered by the practical examinations. It will include anatomy, embryology, physiology, pathology and relations of the ear, nose and throat to other organs and diseases of the body. After a few years, more stress may be laid on fundamental principles. It is not intended to make the examinations in the beginning more severe than is warranted by the present available facilities for the study of this subject. However, it is one of the chief aims of the Board to improve the teaching of Otolaryngology. No one can deny that, unless its foundations are laid broad and deep in the underlying sciences and principles, the superstructure of clinical Otolaryngology in America must always remain incomplete.

[This movement should elevate the standards of practice in otolaryngology by the issuing of certificates to men who have been properly prepared to handle this work intelligently and is one with which the English and Germans are concerning themselves. There is probably no field of medicine which has been more abused than has otolaryngology in recent years, not only in this country but in other countries. Men without any training for this work and with a mere smattering of technic of a few operations have announced themselves as specialists in otolaryngology. The result has been the development of indiscriminate operating on the nose and throat for all sorts of conditions which any well-trained man knows at once would not be influenced in any way by operations in the nose and throat.

As a matter of fact, these men have failed to realize that it is a very simple matter to pick up the technic of operations in the nose and throat, but it requires a great deal of time and study to reach a proper appreciation of when these operations should be undertaken. An untrained man readily finds anatomical variations especially in the nasal chambers, the correction of which he imagines will influence all sorts of head symptoms. The result has been a flood of tinkering operations, especially upon the ordinary irregularities of the nasal septum, the variations in shape and size of the turbinal bodies, and finally the development of indiscriminate operations on the ethmoid has come into vogue, as though the latter is the seat of all sorts, of obscure, undiagnosable pathological conditions correctible by opening the ethmoid cells.

The national organizations devoted to otolaryngology have made it a part of their requirements for membership that an applicant should hold the certificate from the American Board of Otolaryngology and we feel confident that one of the most important advances to the standardization of men preparing for this work is as-

sured through the establishing of this national board.—Ed.]

Pure Gas-Oxygen Anesthesia for Ear, Nose and Throat Surgery. According to E. I. McKesson[2] gas-oxygen presents some peculiar advantages over other anesthetics in this field of surgery. From his experience the author mentions the following:

1. It shortens the coagulation time of the blood.

2. Under pressure, it makes general narcosis safe for patients with obstructive complications, such as quinsy or tumors.

3. It discourages aspiration of pus, blood and infectious material, and with a suitable apparatus offers the best means of resuscitation in these complications.

No pulmonary abscesses or pneumonitis following gas-oxygen in any position have occurred and there have been no deaths as a result of the anesthetic or the operation. The sitting posture is preferable and safer for these operations.

The disadvantages mentioned are mainly, (1) the difficulty in abolishing the pharyngeal reflex unless morphin is also employed, and, (2) the requirement of an apparatus particularly adapted to this work. However, the author feels that the advantages so outweigh the disadvantages that the gas-oxygen anesthesia is to be strongly advised in ear, nose and throat surgery.

[The enthusiastic plea for gas-oxygen anesthesia will hardly be shared by most of the men who have learned to rely on the more quiet method of ether. The statement that no lung abscesses have resulted from gas-anesthesia for tonsil work is not in keeping with facts. We have seen as many as three patients at one time in a hospital suffering from lung abscesses where this method was used.

Patients operated in the upright position are ideally placed for inhalation of such infectious material as is usually expressed from chronically diseased tonsils dur-

(2) Jour. Amer. Med. Ass'n., Nov. 8, 1924.

ing the operation. A much more suitable anesthesia for nose and throat purposes, it seems to us, is the administration of ethylene gas switched over to ether when the patient is unconscious, with the operation always undertaken in the recumbent position, as much to prevent inhalation as for the usual reasons for administering anesthesias in the recumbent posture.—Ed.]

Tutocain. This drug has been used by P. Watson-Williams and E. Watson-Williams[3] since 1924. The following conclusions are based on over 200 observations. Of these, operations such as septal submucous resection, exploratory puncture of the antrum, removal of polypi, cauterization, conchotomy, and so forth, furnished some seventy cases.

Anesthesia. From a consideration of the various findings, including the time factor, the authors came to the conclusion that a 5 per cent. solution of tutocain gave the same results as a 3.5 per cent. solution of cocain—that, in fact, weight for weight, the anesthetic efficiency of tutocain was 70 per cent. that of cocain hydrochlorid when applied to the nasal mucosa. The duration of anesthesia (with adrenalin) was about 45 minutes in a few cases in which it was tested. Some observations were made with 10 per cent. tutocain; the results agreed with previous findings.

Shrinkage. Special attention was directed to this point. The authors have come to the conclusion that tutocain does possess some power of producing shrinkage in the nose. As compared with that of cocain, it was considerably less (in most cases) and took longer to develop; even when complete, a further shrinkage can be produced by cocain. Also, there seemed no effect in arresting hemorrhage; for operative work the addition of adrenalin (1:10,000) was necessary and perfectly satisfactory.

Irritation. No cases of primary irritation were seen.

(3) Lancet, May 2, 1925.

In a few of the rare cases where cocain solution produces late irritation, tutocain did not act in this way.

Toxicity. No case showed either local or general signs of any toxic effect. In three cases, selected because cocain had previously caused disturbance, tutocain did not do so.

[The discovery of a substitute for cocain as a local anesthesia is welcomed chiefly because we do occasionally meet with individuals where there exists an unusual idiosyncrasy for the actions of cocain. With an appreciation of the risks in the administration of cocain there are very few individuals where a different anesthesia need be substituted. In the first place there is no occasion for the use of the stronger solutions to get a satisfactory local anesthesia effect. A 5 per cent. solution of cocain made up in adrenalin applied from a saturated pledget of cotton, left in situ for a few minutes, accomplishes everything that a stronger solution can. But the most important fact regarding the use of cocain is the fact that it is dangerous to inject this drug even in attenuated solutions. For this purpose we have the novocain solution which is very slightly toxic. The superior advantage of cocain over the new drug is the shrinking qualities which are so necessary when undertaking intranasal surgery.—Ed.]

Further Report on Synergistic Analgesia as Employed in Cases About the Head and Neck. In the consideration of the technic of synergistic analgesia J. C. Beck, H. L. Pollock and F. L. Lederer[4] state that the dosage is guided mainly by the age, weight, general condition and mental makeup of the patient. However, the average dose for every fifty pounds of body weight is $\frac{1}{8}$ gr. morphin sulphate combined with 2 c.c. of a fresh, sterile, C. P. magnesium sulphate solution (50 per cent.), and 2.5 per cent. novocain; equal parts of olive oil and ether (each 1 oz.), and 1 dr. of paraldehyd (U. S. P.). For an individual weighing

(4) Laryngoscope, March, 1925.

from 135 to 150 pounds, three doses are usually required.

For an individual weighing from 135 to 150 pounds, the author's method of synergistic analgesia is as follows:

1. "Prepare patient as for general anesthesia on the evening prior to operation, *i. e.*, enema and cleaning of operative field. The enema should be repeated on morning of operation. Give nothing by mouth after midnight.

2. "Three to four hours prior to the time of operation administer intramuscularly deep into the gluteal region or subcutaneously, morphin sulphate grs. 1/8, dissolved in 2 c.c. of a sterile, fresh 50 per cent. solution of magnesium sulphate together with 2.5 per cent. novocain. (Ampules containing the combined solution are now on the market).

3. "Great care should be taken in thoroughly cleansing the site of injection with benzin, iodin and alcohol and equal care should be given to the needle and syringe, which should be absolutely sterile.

4. "These injections are repeated at half-hour intervals until three doses have been given.

5. "A half hour after the last intramuscular injection has been given, administer slowly per rectum (over a twenty minute period) a solution of the following: ether, 3 oz.; olive oil, 3 oz.; paraldehyde, 2 dr.

6. "Proper environment is then supplied by dimming the lights and by guarding against disturbance of the patient.

7. "Transport the patient to the operating room with the least amount of disturbance possible."

The authors discuss in detail the results of laboratory workers in experiments on the drugs used, both separately and in combination. Magnesium sulphate and ether act synergistically in producing anesthesia when injected intravenously in albino rats. Animal experimentation has also shown that anesthesia cannot

be induced by the rectal method of administration of ether-oil (within the limits of safety) unless morphin is previously administered. The addition of 2.5 per cent. novocain to the magnesium sulphate-morphin hypodermic increases the analgesic and anesthetic actions of the combination at least 25 per cent. The action of the magnesium sulphate is to change the value of the morphin from 50 to 100 per cent. without getting the toxic effect of that much of the drug.

In some of the author's cases accessory, local or ether anesthesia was necessary; particularly in cases where skin, mucous membrane or periosteum had to be incised.

The analgesic operative state may be compared to some forms of alcoholic intoxication. The states vary from that of hilarity to that of depression. The majority of patients are responsive to questioning and even volunteer sensible remarks themselves. After operation they remain more or less drowsy until late in the evening when they are sufficiently quiet to go through the night without the need of an analgesia.

Complications. The authors have had some instances when the patient was too deeply narcotized. In these instances the bowel was flushed out and operation postponed until the patient had sufficiently recovered. A painful area at the site of the hypodermic injection occurred in some instances and is to be guarded against.

The types of operations performed under synergistic analgesia by the writers are as follows:

Tonsillectomies.
Simple and Radical Mastoid operations.
Operations on the Larynx.
Operation on the Septum.
Intranasal and Sinus operations.
Facial plastic operations.
Thyroidectomy.

In conclusion the authors state that their report is not one of overly enthusiastic investigators, for the series reported is infinitesimally small in the question

of anesthesia. However, they hope that the work so far done will stimulate further investigation along the same lines.

[An outstanding criticism of this form of obtaining anesthesia is the use of several drugs. Most anesthetists prefer to restrict the work to the administration of a single anesthetic, the action of which is fully understood so that when symptoms arise there is an immediate understanding of what the significance may be. Where several drugs are used like morphin, novocain and ether, one will naturally be confused, when untoward symptoms appear, as to just which of these drugs is at fault. The risk in anesthesia work is always greater where several drugs are used.—Ed.]

Acute Cocain Poisoning. Acute cocain poisoning, with its all too frequent disastrous sequelae, requires for its treatment the development of a closer understanding of the site and mode of action of this drug.

In laboratory animals as well as in man, respiratory failure invariably precedes cardiac failure in concain poisoning. Respiratory failure requires artificial respiration. In the past, artificial respiration, though resorted to both clinically and experimentally, has not been very successful. In the rabbit, however, A. L. Tatum, A. J. Atkinson, and K. H. Collins[5], have been able by artificial respiration alone to raise the lethal subcutaneous dosage from approximately 100 mg. per kg. of body weight, the usual fatal dose, to from 300 to 350 mg. per kg., with return of efficient respiratory center function. In the dog, on the other hand, artificial respiration alone was an inadequate procedure, since it was not possible to raise the lethal dosage by this means.

Years ago it was shown that decerebrate animals were considerably more tolerant than normal animals. Furthermore, the authors were much impressed

(5) Jour. Amer. Med. Ass'n., Apr. 18, 1925.

by the manner in which the respiratory center of the rabbit fails, namely, the respiration becomes more and more rapid and shallow, soon passing into a respiratory flutter or tremor, and then ceasing all activity. In the dog this also is seen, but it is not quite so marked. This would seem to indicate that the center failed in a stage of over-activity or excitability, a "jamming of the mechanism." Since decerebration raises the tolerance, it should follow that a contributory factor in the respiratory failure is some influence of the brain on the respiratory center, in addition to a direct drug action on this center.

With these conceptions in mind, the authors resorted to the use of hypnotics in both prevention and treatment of cocain convulsions. Their choice for the immediate purpose was either barbital sodium or a mixture of barbital sodium with paraldehyd. With the intravenous administration of 100 mg. of barbital sodium per kg. of body weight, with 5 c.c. of a saturated solution of paraldehyd in saline solution per kilogram of body weight, they were able to raise the lethal subcutaneous dosage of cocain in the dog from approximately 26 mg. per kilogram to something over 100 mg. per kg., an increase of tolerance of approximately 400 per cent. This high tolerance was reached only in those animals to which the hypnotics had been given before the onset of convulsions. If convulsions were allowed to occur, the dosage from which recovery was obtained was lower. Animals allowed to remain in convulsions for five or more minutes recovered only in case they had received not more than 50 mg. of cocain per kg. The shorter the time the convulsions were allowed to continue, the greater the dosage of cocain that could be tolerated, up to approximately 100 mg. per kg. in case no convulsions were permitted; and, reciprocally, the shorter the convulsion period, the greater the chance of recovery.

The authors come to the following conclusions:

1. The hypnotics given as indicated above immediately stop the clonic convulsions.

2. The longer the convulsion period is permitted to continue, the less is the likelihood of recovery.

3. The brain, the evident seat of the clonic convulsions, plays a tremendously important part in the resistance or susceptibility of the respiratory and probably other medullary centers to cocain poisoning.

4. From their own experience and the experience of others, atropin, chloral hydrate, ether and morphin, separately or variously combined, are not satisfactory antidotes for cocain poisoning, either having no significant effect or even actually increasing the dangers.

5. These experiments were done on laboratory animals under controlled conditions, and point to the fundamental underlying causes of death in cocain poisoning as being essentially a summation of direct injury by the drug and the deleterious influence of the cocain-poisoned brain on the medullary centers.

Some Criticisms of the Technic of Otolaryngologists. One writer has said that the technic of the otolaryngologists as a class, compares very unfavorably with that of other surgeons. In their operative work, the otolaryngologists usually scrub up carefully and use sterile gowns and gloves and then spoil their careful antiseptic precautions by adjusting their dirty head mirror, thus contaminating their gloves and the whole operation.

J. M. Ingersoll[6] offers the following suggestions for improved technic: It almost goes without saying that all instruments should be sterilized every time they are used, whether for simple treatments or operative work.

In making applications in the nose, an applicator should be chosen with a pledget of cotton which is small enough to slip through easily between the septum and the tissues on the lateral nasal wall. The

(6) Ohio State Med. Jour., December, 1924.

application must be made skillfully and gently and avoiding injury to an already inflamed membrane. Practically all of the necessary nasal applications can be made without pain. If the patient is hurt, the patient's complaint is a just criticism of the surgeon's skill.

In making applications on the tonsils and pharynx a fairly large pledget of cotton, with the free end loose and fluffy, dipped in the medicine to be used and then simply touched against the mucous membrane will diffuse the medicine over the moist membrane without trauma and usually without making the patient gag. For the ordinary applications in the larynx, the intratracheal syringe is the best instrument and if the medicine is allowed to drop into the larynx slowly there is usually no coughing or spasm. If the medicine is squirted in with force, there is almost invariably a spasm of coughing.

Small pledgets of cotton wound on a toothpick and then sterilized are a great time saver in ear work and are the best applicators. If the end of the toothpick is dipped in any good library paste and then the cotton is wound on it, the cotton will still cling to the toothpick after it is sterilized.

In all operative work the same general preparations and surgical technic should be used that every good surgeon advocates and uses, and if it is necessary to touch the head mirror or anything else which is contaminated, the gloves (or hands) can be protected with a large sterile sponge. In this way many of the septal abscesses and other infections which occur in work in the nose, throat and ear will be avoided. The same care in preventing the introduction of new infections, should be observed in the dressing and after treatment of operative wounds.

The amount of postoperative shock is dependent to a considerable extent upon the amount of trauma done in the operation. If the surgical technic is good and

the operation is skilfully done, not by brute force, the results obtained will be gratifying to the surgeon and the patient, and if any infection or complication manifests itself it will be evident that it was not due to faulty technic.

Facts and Considerations in a Study of the Thyroglossal Tract, with an Account of the Embryologic Conditions. The thyroglossal tract takes origin from an outgrowth which arises immediately behind the tuberculum impar, and which is concerned ultimately in the formation of the isthmus and lateral lobes of the thyroid gland. A. P. Bertwistle and J. E. Frazer[7] state further that the thyroglossal remnants above the hyoid are few, and if present are usually either near the foramen or near the hyoid. Below the hyoid the tract is present completely in many cases, incompletely, *i. e.* potentially in others.

The complete infrahyoid tract extends from the hyoid, usually folded up behind it from below, to the thyroid gland, either centrally or on one side. The incomplete tract has potentially exactly the same line; it is the tract simply broken up, and its parts remain in situ. Any of these remnants may take on further development, especially if a condition of relative hypothyroidism exists. It is possible that some cells of the tract may be separated from and lodged below the level of the gland. If this is so, these cells may also be liable to take on further development. Cysts lying superficially below and behind the foramen cecum may have a possible origin from a space included between the two halves of the developing posterior part of the tongue, and not necessarily be connected at all with the thyroglossal tract. Any appearance of a potential duct, judging from the arrangement of cells, seems to be confined to the suprahyoid portion.

The unsatisfactory results of operations performed on the cysts and fistulas of the thyroglossal tract are

(7) Brit. Jour. Surg., January, 1925.

well known. Undoubtedly, incomplete removal is the most common cause of failure, but the inexact knowledge of the thyroglossal tract and its relationship to the hyoid bone account for some of the poor results of operation. Another reason for unsatisfactory results is that the fistulas always become infected. Frequently attention is first drawn to the cysts when suppuration sets in, and they become tender. Division of the hyoid is rarely necessary if the dissection is carried up well behind the bone. A suggestion is put forward that the thyroglossal fistula is in direct anatomic relation with the thyroid gland, and that, pari passu with that of the salivary glands, its activity is increased during digestion. At operation a horizontal incision in the line of the natural crease of the skin of the neck should be adopted whenever possible.

Syndrome of Avellis. This syndrome is caused by hemorrhage in the area of the nucleus ambiguus and the spinal fillet in the medulla, but may also be produced by cerebrospinal syphilis, tuberculoma or syringomyelia. According to C. J. Imperatori[8] the diagnosis is based essentially on the following:

1. Paralysis of the soft palate, partial paralysis of the constrictors of the pharynx, paralysis of the vocal cord and partial paralysis of the esophagus. These paralyses are ipsilateral to the lesion.

2. Contralateral loss of pain and temperature sensibility of half of the body below the interauricular line.

3. The retention of all other somatic types of somatic sensation in the areas showing defects in pain and temperature sensibility.

4. Chronic endarteritis.

5. The absence of all other symptoms, that is, motor and sensory disturbances.

In the differential diagnosis it is necessary to differentiate hysteria, labioglossopharyngeal paralysis,

(8) Arch. Otolaryngol., March, 1925.

syringomyelia, tabes, lateral sclerosis, general paralysis, gummas, post-typhoid and diphtheritic paralysis, and other lesions in the neighborhood of the nucleus ambiguus. Recurrent paralyses due to lesions in the neck, jugular formen syndrome, typhoid and malignant disease, post-thyroidal operations, carotid tumors, aneurysms, lesions of the mediastinum, pulmonary lesions of the apex, pleuritic thickenings, mitral stenosis, pericarditis, syphilis, and trauma, such as stab or gunshot wounds, must also be differentiated.

The author reports three illustrative cases. In two of the cases, by means of the esophagoscope, the condition of semi-paralysis of the esophagus was noted, as well as the spasm of the cricopharyngeus on the side opposite the paralysis of the vocal cord. Both of these patients were able to swallow water immediately after the esophagoscopy. This procedure was done without an anesthetic.

All three patients were women, past middle life, and most of the symptoms cleared up in from three to twelve weeks. The pain and temperature changes, due to the spinal fillet involvement, have not entirely cleared up in the first case, even after two years.

In conclusion the author states that:

Given a patient, with a high blood pressure, past middle life, in whom there is a sudden onset of symptoms such as a sudden change in voice accompanied by difficulty in swallowing, one should consider the possibility of the lesion being in the medulla in the place described. However, there have been some cases of this condition reported in young children, so that age should not be one of the cardinal signs.

A competent neurologist will be of material assistance in diagnosing the condition. Usually, these patients do not succumb to the primary lesion, but partially recover.

Ear, Nose and Throat Complications of Scarlet Fever. Of 589 cases of scarlet fever admitted to the

Isolation Hospital, Toronto, J. G. Strachan[9] states that 160 developed complications, as follows:

1.	Acute otitis media	98 cases
2.	Acute mastoiditis	10 "
3.	Sub-acute mastoiditis	12 "
4.	Acute accessory sinusitis	8 "
5.	Peritonsillar abscess	7 "
6.	Retro-pharyngeal abscess	2 "
7.	Purulent rhinitis	6 "
8.	Catarrhal rhinitis (persisting)	4 "
9.	Nasopharyngitis "	7 "
10.	Acute labyrinthitis	1 "

The degree of throat infection seems to depend on the presence or absence of tonsils and on the condition of these structures. If the reaction in the throat is limited to redness and swelling of the mucosa it is regarded as part of the general disease. If any exudate or membrane is present something else has been added, *i. e.*, an infection which is practically always of a streptococcal nature. This throat invasion varies from the mildest exudate on the tonsils and possibly a false membrane, to one of the most intense reactions, with membrane spreading rapidly to the nasopharynx and possibly to the larynx. Hypertrophied tonsils invariably become infected and swollen causing distress not only by presenting a large inflamed area but by obstructing the food and airways. The general condition of the patient almost invariably depends on the condition of the tonsils and pharynx.

Brilliant results have been claimed for the early operative treatment of septic tonsils in scarlet fever. Enucleation or pillar separation are advocated as early as the first week. Complications are said to be avoided by these measures but as the majority of complications occur in the first week of illness operation would have to be undertaken very early, *viz.*—at a time when the general reaction is at its height. At present it is the routine to treat the throat infection during the acute

(9) Can. Med. Ass'n. Jour., November, 1924.

stage with repeated hot saline irrigations. Operative measures when indicated are not attempted until the reaction in the throat has subsided, *i. e.*, in the third week or later.

With the throat infection there is necessarily some involvement of the nasopharynx. Usually this will subside with the reaction in the throat, but frequently a subacute infection persists well into the convalescent stage. There is usually a rather copious mucopurulent discharge from the nasopharynx and nose. The mucosa of these parts is congested and swollen. The lateral pharyngeal lymphoid masses are prominent and the cervical glands are enlarged and tender. In practically all such cases enlarged adenoid masses were removed and the symptoms rapidly disappeared. In other cases some nasal obstruction seemed to be the cause. An alkaline nasal lotion of warm Seiler's solution is very useful in helping to clear up these cases.

It is not surprising in cases with septic tonsils that the infection should spread to the peritonsillar tissues. As a general rule the diagnosis of peritonsillar abscess presents no difficulty. An abscess in the retropharyngeal tissues occasionally develops which is apt to be confused with the peritonsillar abscess and is even more likely to be missed. Obscured by the tonsils, as these abscesses often are, it is only the increasing dyspnea that makes one suspicious of their presence. Fortunately retropharyngeal abscesses seem to be less common in scarlet fever than in other infections. The treatment of both types of abscess is early incision and drainage.

With the throat infection there is generally some disturbance in the nose. This may vary from a mere congestion of the mucosa to a suppurative condition confined to the nose itself or including one or more of the accessory sinuses. In the acute stages, unless especially urgent, active treatment for the nose is not advisable. The mucosa usually returns to normal

with the subsidence of the general reaction. Accessory sinusitis usually appears in the first week of the disease. Only eight cases developed sinusitis in this series.

[This timely article brings clearly to mind the serious menace of scarlet fever infection. That this menace is enhanced where the child is suffering from the condition of enlarged tonsils and adenoids has long been recognized. We have not hesitated in such cases to carry out without anesthesia, operations upon the tonsils. The enormous hypertrophied tonsils can be quickly removed, if not completely enucleated, by a tonsillatome with immediate relief of many of the distressing symptoms.

With the work carried out by the Dick's we have reason to hope that the serious menace from scarlet fever may be relegated to the same place as the menace that previously existed from diphtheria before the discovery of antitoxin.—Ed.]

Syphilis of the Nose and Throat. In this article G. M. Coates* states that hereditary syphilis usually takes the form of a coryza or "snuffles." This merely consists of erythema and mucous patches, secondary syphilitic lesions on the nasal mucous membrane. Tertiary lesions, causing destruction and disfigurement, may appear at any period between the fourth and twentieth year of age.

In acquired syphilis, 60 per cent. of the extragenital chancres occur in the mouth, especially on the lips and tongue. The chancre may also be found on the tonsil, gums, hard or soft palate and on the mucous membrane of the cheek. A chancre in the nose usually occurs in the vestibule at the mucocutaneous junction. It is also seen on the septum, where it never causes a perforation.

The secondary lesions of syphilis of the nose and throat are those that occur on the surface of the skin, modified only by the peculiar influences to which their

(*) Atlantic Med. Jour., July, 1925.

occurrence in these locations expose them. Thus, the lesions all show maceration. Secondary syphilis of the nose is uncommon. When present it may appear in the form of an erythema, or of mucous patches. In the mouth the most common lesion is the well-known mucous patch. The patches have a red, but not angry base, which is usually covered by a thin, bluish-white or grayish exudate, around whose edge a narrow border of red shows. The mucous patch must be differentiated from ordinary traumatic ulceration, Vincent's angina, aphthous stomatitis, and pharyngitis, caused by the pneumococcus. It is to be noted that mucous patches, as a rule, leave no scars.

The two common forms of tertiary syphilis are diffuse infiltration and gummata, and may be found in any position in the nose, throat or mouth. The lesions usually do not occur within two years from the initial infection, and may not be first seen before from five to fifteen years after. In the nose, gummata usually invade the bony portion of the septum, giving rise to considerable deformity when not checked. In the throat the posterior walls of the pharynx and nasopharynx are most frequently attacked. Gummata may also invade the soft palate or hard palate, and produce a large perforation in the latter instance.

The author emphasizes that in order to treat these cases successfully and to prevent serious deformities, early diagnosis must be made and vigorous treatment instituted immediately.

Further Statistics on Chlorin Gas as a Treatment for Respiratory Disease. In this article M. F. Jones and C. Garofalo[1] have reported on 300 patients treated by this method. The total number of treatments given these patients was about 800.

The authors' technic was the same as that reported by Vedder and Sawyer. A concentration of 0.02 mg. of the gas, per liter was used, as this dilution was found

(1) Arch. Otolaryngol., January, 1925.

to be about as strong as the average patient could stand without discomfort. In the hot, humid weather of summer it was even reduced to 0.015 mg. per liter.

Treatments were given only once in some instances and in others were repeated at intervals of twenty-four hours for several days.

From their results the authors come to the following conclusions:

1. There is an improvement in the acute cases involving the upper respiratory tract. This improvement is more marked if the treatment is given on consecutive days.

2. There is a germicidal action for certain bacteria (see article of M. B. Patterson, page 441).

3. In asthmatic patients, allergy and tuberculous patients, chlorin treatment is contraindicated.

4. The number of whooping cough patients was too small to permit conclusions, but the authors feel they were not markedly benefited.

5. Chlorinated air has no alleviating effect on patients with free pus in the nose or rhinopharynx.

6. As a sterilization of the field of operation for nose and throat conditions, chlorin is not sufficiently germicidal in the dilution tolerated to be of benefit.

7. As a prophylaxis for acute respiratory epidemics, the authors' experience has been insufficient to permit conclusions.

8. In 106 treatments, where the bacteriologic findings were compared with the clinical results, there was agreement in 67 cases, or 65.1 per cent., and disagreement in 39 cases, or 34.9 per cent.

Since the bacteriologic and clinical findings agreed in the larger percentage of cases, the writers feel convinced that their deductions are made on a comparatively accurate basis.

Colds and Their Treatment With Chlorin. At the University of Minnesota H. S. Diehl* has treated a

(*) Minn. Med., July, 1925.

series of 425 cases of acute colds with chlorin, using the apparatus and concentration of chlorin as advised by Vedder. A series of 392 students was used as a control. From the results obtained the author comes to the following conclusions:

1. Approximately 50 per cent. of people with colds will recover within three days, and 75 per cent. within a week, under little or no treatment.

2. Every study concerning the value of any treatment of a self-limited disease should include a control series of cases.

3. Any beneficial results from treatments with chlorin gas are experienced within the first day after the treatment.

4. Of patients with rhinitis 23.6 per cent. recovered within one day after treatment with chlorin as compared with 6.7 per cent. of the control series; and 19.5 per cent. of the entire group recovered within one day after treatment with chlorin as compared to 12.5 per cent. of the control series.

5. The percentage of recoveries within three days after treatment was almost as large in the control series as in the chlorin series, 47.9 per cent. as compared to 51.4 per cent.

6. It is doubtful whether chlorin treatment can be expected to give any beneficial results if it is administered by methods which do not give a definite and uniform concentration of the gas.

[The difficulties of arriving at any accurate conclusions regarding the value of any method of treating acute colds are obvious even where an effort is made to guard against possible errors in conclusion by controls. No two patients take the same course in this commonest of all complaints. Dissimilarities in courses of different epidemics are just as outstanding. There is nothing in the whole field of medicine which would be a greater boon to humanity than the discovery of an efficient cure for acute head colds, not only because of the incon-

venience caused by this affliction but also because of the numerous serious sequelae such as pneumonia, otitis media and so forth. The optimism which was occasioned by the widely heralded first reports on the chlorin treatment has not been justified by subsequent observers. It would seem that many more experiments conducted along lines similar to the one here recorded may be necessary before we can arrive at a proper evalution of this treatment.—Ed.]

Chlorin in Respiratory Diseases. Under current comment[2] the writer states that when the announcement first appeared last March, that Vedder and Sawyer of the Army Medical Corps had been able to devise a method for administering chlorin, in the treatment of respiratory diseases, which seemed to have a distinctly beneficial effect in this class of ailments, it was received with exceptional interest. This interest was stimulated, no doubt, by the fact that high officials of our government, including even the President of the United States, had submitted to treatment by this method and had expressed satisfaction with the results. Immediately, individual physicians, as well as hospitals and health departments, undertook to test chlorin administration on a large scale, with a view to establishing finally its actual adequacy. In New York City, Health Commissioner Monaghan established two clinics under the direction of L. I. Harris, in charge of the Bureau of Preventable Diseases. These clinics began active work, June 1, and continued until August 1. The results of the experiment have just been made available through the health bulletin of the Department of Health of the City of New York.

According to the report, only 6.5 per cent. of 506 persons with various respiratory diseases reported themselves as cured, in contrast to 71.4 per cent. of 931 patients reported cured in the original paper of Vedder and Sawyer. Fifty-three per cent. of the patients

(2) Jour. Amer. Med. Ass'n., Dec. 6, 1924.

treated by the New York clinics reported improvement, but the physicians in charge do not attach much importance to such reports, since it is well known that patients with minor respiratory infections tend to improve, within certain limitations, by the very nature of such diseases. As is mentioned, the report of the New York investigators concerns only acute cases, and the conclusion is that in such instances at least the claims are unjustified.

Much has been said of the use of the method in whooping cough, but eighteen cases of this disease studied with twelve controls failed to show any appreciable advantage of the chlorin method of treatment over that previously used. The method was without apparent benefit in asthma and in hay-fever; indeed, three patients with asthma became decidedly worse under treatment. The results of this controlled investigation are, therefore, such as to deprecate definitely the claims originally made for the method by the Army medical investigators.

The physician is confronted with a situation in which the original investigators, whose work seems to have been conducted in a scientific manner, report excellent results which other investigators working independently have failed to confirm. Obviously, the results of numerous investigations being made elsewhere must also be brought to light before any opinion is warranted as to the future of this method of treating disease. Certainly the individual physician who purchases such apparatus and uses it in his practice must do so with the distinct understanding that he is using an unestablished method.

The manufacture and sale of expensive apparatus for the administration of chlorin gas treatment followed immediately upon the publishing of the first work along this line and before the possible opportunity of any adequate evaluation of the treatment. Many thousands of these apparatus were sold to general physicians as

well as to the type of otolaryngologists who are not trained to mark careful observations, judging of results. All of this is a serious impediment to real progress in therapeutics. Manufacturers should not be so ready to get out new devices for a treatment which is of only problematic benefit. It speaks very little for the intelligence of physicians to fill their offices with new and bizarre devices for the treatment of disease until there is satisfactory evidence that such treatments are of any particular value. It constitutes a form of charlatanism which clutters up the work of the otolaryngologists more readily, perhaps, than the work in any other special field.—Ed.]

The Study of Affections of the Nose and Throat with Special Reference to the Diagnosis of Affections in Other Parts of the Body. E. Mayer[3] discusses a number of conditions which are of interest to the general medical man.

In laryngeal vertigo the attack begins with a tickling in the throat, causing cough, the face becomes congested, and the patient falls unconscious. While the attack simulates epilepsy, there are few if any general muscular spasms, the tongue is not bitten, there is no nausea, and no head symptoms. Elongated uvula and hypertrophied lingual tonsils are frequent causal factors.

Reflex cough may be caused by a number of things, among which the author mentions: follicles in the posterior pharyngeal wall, foreign body in the ear, elongated uvula, hypertrophied lingual tonsil, and foreign bodies in the nose.

Neuroses. In the larynx these arise from lack of function of the adductors—the cords move freely but fail to approximate. These are either occupational, or have their origin in such constitutional disturbances as produce muscular inertia in other parts of the body. Adductor paralysis where one-half of the larynx

(3) Jour. Iowa State Med. Soc., November, 1924.

remains fixed, while the other half moves freely toward the immobile half is always a serious condition for it means pressure on the recurrent laryngeal nerve, in most instances due to an aneurysm. Paralysis may also follow an operation on the thyroid.

The question of the *tonsils* is so well known that the author merely mentions that a normal tonsil has its function while a diseased one is undoubtedly a serious menace.

Tuberculosis may be recognized early if a careful examination is made. Yellow exudates may appear anywhere in the mouth, palate, tongue, cheeks or lips. They also occur in the nose. When found in numbers the tuberculosis is apt to be miliary in character and the prognosis exceedingly grave. Inter-arytenoideal thickening is an early evidence of laryngeal tuberculosis.

Lupus is an attenuated form of tuberculosis. It is found either in the nose or throat.

Syphilis may occur in any of its stages. As a rule the history and the Wassermann test will confirm the diagnosis. In cancer of the upper air passages the author feels that radium is the treatment of choice. Typhoid fever may produce a perichondritis, and for which a tracheotomy is necessary. Vincents angina is most often seen in the fauces and tonsils. Ordinarily it runs a mild course, but at times it is associated with severe destruction.

Lichen Planus. These are minute papules, small, waxy-looking and shiny, bright red in color; generally smooth on the surface, sometimes covered with a firmly adherent scale, on the body.

Leucoplakia. This occurs on the tongue, especially at the margins, on the buccal mucous membrane in contact with teeth, at the angles of the mouth and on the mucous lining of the lips.

Mycosis. This appears in the form of fungoid growths, resembling lymphoid structures in appear-

ance on the mucous membranes of the throat, and at times with superficial ulceration.

Geographical Tongue. This is also called mapped tongue, wandering rash, ring worm, circular or annulus migrans. Its pathology is unknown.

Pemphigus Vegetans. This is a rare but very terrible and fatal form of pemphigus in which the bullae instead of drying up, the site remains excoriated and ulcerates at points of pressure and in the flexures fungating masses are produced. They have been mistaken for syphilis.

Rhinophyma is an affection covering the tip and ala of the nose, resulting in great enlargement under the skin, and while occasioning no pain is very distressing because of its disfiguring nature. Nothing is known of its origin and surgery seems to be the best treatment.

Rhinoscleroma occurs only in persons who are natives of Poland and Galacia. It appears in the form of firm indurations on the skin and mucosa, is chronic in its course, and made less active by roentgen ray treatment.

Leprosy appears in the upper air passages. In the prolonged first stage there is marked infiltration and swelling of the mucous membrane. It attacks the septal cartilage producing hemorrhage. Nodules may form and with rapid necrosis. Hard, fetid crusts occur. Finally cicatricies form, and the mucous membrane becomes leathery, anemic, whitish, yellow, or brownish red. The turbinates often disappear. Strict quarantine and segregation are essential.

Glanders is an extremely infectious condition appearing in the nose and larynx in the form of nodes and nodules, more rarely as diffuse infiltrations consisting of round cells without giant cells. The nodules suppurate rapidly and there is frequent hemorrhagic infiltration.

[Mayer presents in a rather masterful way an ambitious subject, reviewing for us in a very few words

the outstanding features of most of the diseases involving the nose and throat. The facts presented in this paper are such as every otolaryngologist should always have clearly in mind.—Ed.]

The Nose, Throat and Larynx in Thyroid Disease. Routine examination of about 400 thyroid patients has led R. Nebinger* to believe that focal infections, especially of the tonsils and teeth, apparently have some part in the production of the condition of hyperthyroidism. Ninety per cent. of the author's cases showed tonsillar infection, 50 per cent. gave a history of recurrent attacks of tonsillitis, and in no case had the tonsils been removed prior to admission to the hospital. Comparatively few cases showed any outstanding nasal infection.

In the adolescent type of thyroid enlargement the author has been advising tonsillectomy if the tonsils show the slightest infection. Removal of infected tonsils, in addition to iodid medication, has proved highly successful in these cases, whereas the medication alone has been very disappointing.

Laryngeal examination is very important in thyroid cases. The condition of the larynx and vocal cords should be noted prior to the thyroid operation so that changes seen afterward may be compared. The author discusses the several conditions which may be found in the larynx pre- and post-operatively. The best treatment for post-operative bilateral paralysis of the cords, where dyspnea is urgent, is probably Jackson's ventriculocordectomy. More recently union of the recurrent laryngeal with the hypoglossal nerve has been advised, but as yet sufficient time has not elapsed to prove its status.

Electrocoagulation and Radiation Therapy: In Malignant Disease of the Ear, Nose, and Throat. According to G. E. Pfahler† electrocoagulation has, from its

(*) Atlantic Med. Jour., June, 1925.
(†) Jour. Amer. Med. Ass'n., Aug. 1, 1925.

nature, only a limited field of application in the malignant conditions of the nose and throat. Some of the prohibiting factors are:

1. Electrocoagulation consists in the destruction of the disease by coagulation of the tissues. The heat is caused by the resistance in the tissues to the flow of the high frequency electricity.

2. It differs from the destruction by cautery; it is not a transmitted heat, but is heat generated in the tissues and extends to a greater depth than that of the cautery.

3. It destroys all kinds of tissue in its path, and, therefore, cannot be used where blood vessels, nerves, bone or other essential tissues must be preserved.

4. It is a painful procedure and must be used with either local or general anesthesia.

5. If the area to be destroyed is supplied by large blood vessels, these arteries must be ligated in advance for fear of a secondary hemorrhage, when the slough separates.

6. There is always a sloughing process which will continue for several weeks or months, until all the dead tissue has been thrown off.

7. If bone has been destroyed, it will suppurate, and generally separate as a sequestrum.

8. Electrocoagulation can be used wherever the cautery can be applied and often also in very small areas where only a single wire can be introduced.

9. It must be used under the guidance of the eye, and much skill is required in order that the tissue may be destroyed to the proper depth.

10. Tissue can be destroyed by plunging the needle to any depth, but this demands skill, experience and an accurate knowledge of anatomy.

Radiation, on the other hand, has been used extensively with good results. It can be used to advantage preceding operation, and should always be used in conjunction with electrocoagulation.

Radium is preferable to roentgen rays when it can be brought into contact with the malignant disease, or safely inserted into the lesion sufficiently. Roentgen rays are preferable when the malignant disease lies more than 2 cm. in depth, or when the malignant disease lies beyond healthy tissue which must be preserved. In the use of either of these forms of radiation it is best to bring the radiation in the diseased area within a few days or a week to 100 per cent. of an erythema dose (saturation point), by daily treatments, and then keeping it at this "point" by subsequent fractional dosage, for a period of from ten to fourteen days.

Epitheliomas that involve the skin over the nose can all be cured, if treated by electrocoagulation, or thoroughly by irradiation, before they have invaded the cartilage, bone or ethmoid cells. The epitheliomas that originate in the mucous membrane of the nose are best treated by radium, locally applied, sufficient to destroy the disease and to turn the surrounding mucous membrane white. This will require about 1,000 mg. hours of radiation and should be distributed over a period of about ten days. Only rarely can electrocoagulation be used to advantage. Sarcomas and angiosarcomas, are not treated by electrocoagulation, but by a combination of radium in the nostril and nasopharynx and by cross firing with high voltage roentgen rays. Carcinoma and sarcoma of the antrum, like malignant disease anywhere, should be treated according to the special conditions present in the individual case.

Fibromas of the nasopharynx are best treated by radiation. The author does not believe sarcoma of the nasopharynx should be treated by electrocoagulation as there is great danger of secondary hemorrhage. Radiation is entirely satisfactory in these cases. It should also be used in carcinoma of the tonsil, the earlier the better.

The author has had no experience with electrocoagu-

lation in malignant disease of the larynx, but believes it should be satisfactory. Radium and roentgen ray treatment may be carried out in inoperable cases and with fair hopes of success.

Diseases of the Nose

Nasal Fracture and Deformity

Fractures of the Nose. In injuries of the nose there is usually considerable swelling of the soft tissues soon after the accident. For this reason the diagnosis of a deformity is frequently not made. Later, when the edema has subsided, the defect becomes painfully evident, and the physician must admit the failure on his part to make a correct diagnosis and to institute proper treatment.

To obviate this condition B. C. Gile[4] urges that all cases of nasal injury be examined intranasally, with the aid of reflected light, the nasal speculum and a blunt probe. In this way the fracture and deformity of the nasal bones or septum may easily be diagnosed. Once diagnosed, proper treatment can be instituted, even though several days have elapsed since the injury. This is possible because ankylosis does not take place within that length of time.

The treatment consists of first cleansing the nostrils and shrinking the nasal membrane with adrenalin. Eight per cent. cocain is applied as a local anesthetic. With a self-retaining speculum in place, the nasal bone on the one side is restored to its normal position by gently lifting it with a blunt probe or applicator, introduced intranasally. This procedure is then repeated

(4) Atlantic Med. Jour., May, 1925.

on the other side, so that the whole arch is elevated. Only in exceptional cases is intranasal support necessary to keep the fractured bones in place. When needed, Simpson-Bernay splints can be introduced until there is sufficient agglutination to prevent displacement.

The deflected septum is usually straightened by the elevation of the nasal bones and requires no other treatment. If any bulging remains, it may be corrected by the pressure of a splint retained for a few hours and withdrawn while still aseptic. Whatever obstruction there has been to respiration will disappear when the intranasal passages are restored to their normal size and shape.

When treated in this way, a fracture of the nose may be entirely cured, leaving no internal obstruction and no external disfigurement; a consummation much to be desired and now so often unattained.

Treatment of Nasal Deformities, with Especial Reference to Nasal Prosthesis. After discussing the etiology, V. H. Kazanjian[5] states that in the treatment of these deformities one must resort to either surgery or prosthesis and, in some instances, combinations of the two. The relative merit of each type of treatment depends on the circumstances and peculiarities of each individual case. Extensive reconstruction of the nose often requires a series of operations which means that the patient must have a fair degree of health and vitality. Most individuals having gross nasal deformities are past middle age and are weakened by the disease that caused the deformity. Therefore, in spite of the great possibilities of surgery, it is often necessary to select prosthesis as a means of correcting the deformity. The modeling of the nose is done on a cast with modeling clay or wax. Much assistance may be obtained from former photographs of the patient and

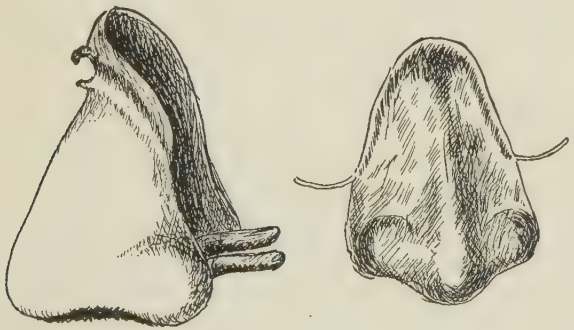
(5) Jour. Amer. Med. Ass'n., Jan. 17, 1925.

by a study of the noses of the immediate relatives who have a family resemblance.

Prosthetic noses may be made of vulcanite rubber, copper or gelatin compounds. The first two have the disadvantage of being opaque and therefore it is difficult to apply the various tints necessary to obtain a good flesh color. The gelatin compound consists of gelatin, glycerin, kaolin and petrolatum. The mixture is heated in a double boiler and poured into a mold. The resulting model is sufficiently tough to hold its shape and at the same time is quite flexible, resembling the natural nose. The prosthetic nose is retained in place by being pasted on the face every morning. The life of a gelatin nose is not longer than one week, but to offset this objection the mold of the nose and the formula are given to the patient with instructions how to make additional new ones. From an artistic point of view, when gelatin is incorporated with the necessary dyes for the purpose of imitating the color of the skin, the result is excellent. The translucence and porosity of the gelatin are distinctly superior to other materials.

Retention of a prosthetic nose may be accomplished by: (1) the use of spectacles; (2) adhesion by contact with nasal and facial tissues on which it rests; (3) extensions into the nasal cavities; (4) various devices from the oral cavity to the nose and (5) adhesive glues. In a given case, one must try to utilize all available means of anchorage. The use of spectacles for retention is one of the oldest and commonest methods. Usually the spectacles are fastened to the bridge of the nose so that the entire weight of the appliance is held by the ears through the lateral arms of the spectacles. This method is not fully satisfactory because it lacks stability, since the spectacles cannot be made secure enough to the ear to get the desired effect, and because with the glasses attached to the bridge of the nose pressure will tend to dislodge the lower border.

To offset these objections the author devised a method which focused the pressure at the middle of the nose at its lateral aspects. For this purpose heavy tortoise-shell glasses are used. The lower curvature on each side as well as the bridge fits the nose accurately, the greatest contact being at the lowest point. If necessary, two fine wires may extend from the sides of the nose to meet behind the lowest point of the spectacles on each side (Fig. 52). These wires are hidden by the heavy frame and are not conspicuous. The spectacles are not fastened to the prosthetic nose.



A *B*

Fig. 52.—*A*, Grooves at lateral aspect of artificial nose, and two extensions into nasal cavity; *B*, Lateral wires, which fit accurately to the inside of the frame of the spectacles, thus exerting pressure at middle of appliance.

Spectacles, no matter how accurately adjusted, will not prevent the appliance from slanting downward, a very annoying feature. In this respect, projections to the nasal cavity form an essential auxiliary point of retention. Extension to the floor of the vestibules is the most practical location. The greatest amount of security is obtained when the prosthetic nose is anchored to a dental plate or bridge, either through an existing or artificially made aperture.

Internal and external prosthesis has been employed

in nasal reconstruction. The former is of no value; the external method has a limited use in certain suitable cases.

Comparative Study of Ivory and Organic Transplants in Rhinoplasty. According to J. Maliniak[6] clinical observations have shown that transplantation of *bone* fragments for correction of nasal deformities often is followed by an evident absorption. Experimentation in animals confirms this clinical observation. The following conclusions may be made:

1. The bony prothesis is difficult to manage and its use in nasal deformities often fails to satisfactorily correct them.

2. With or without periosteum, the osseous graft is absorbed more or less quickly and it is impossible to predict the rate of absorption.

3. It is more fragile than cartilage and more readily infected. Once infected, it is almost always totally eliminated.

Cartilages transplants are usually easy to obtain in sufficient quantity and easy to model. The cartilage has tendency to bend with the perichondrium in its concavity. However, without the perichondrium, the transplant remains straight. When small fragments of cartilage are needed, the alar cartilages may be utilized. Auricular and costal cartilage furnish larger pieces.

The author notes that inorganic transplants have been rejected for a long time. However, he feels that *ivory* should prove very satisfactory as it is easily sterilized, approximates bone in structure, and is not absorbable. While it does remain slightly mobile on the bony foundation, there is no displacement because it is very quickly surrounded by a fibrous capsule. The latter is always clearly visible in the *x*-ray. Bone transplant is especially indicated in pronounced deformities where a large amount of substance is neces-

(6) Laryngoscope, November, 1924.

sary to correct the defect of the dorsum and the lateral sides of the nasal pyramid.

The operation for nasal deformity is performed under novocain-adrenalin anesthesia. The author strongly advises the endonasal route in the majority of cases. The external route is used where (1) there is infection of the nasal fossae or sinuses, (2) the cicatrices of a previous operation might make the closure of the new incision doubtful, and (3) where an ivory transplant is used.

The author describes his technic for both the internal and external operation, and illustrates his results with a report of five cases.

The Nasal Accessory Sinuses

The Present Status of the Intranasal Ethmoid Operation. J. A. Pratt[7] emphasizes the fact that if the sheaths of the olfactory nerves are opened during an ethmoid operation, the infection is apt to spread through that channel and to result in meningitis. The olfactory nerves, entering the nasal cavity through the cribriform plate, sometimes branch over the whole middle turbinate, including the overhang. The olfactory area should therefore be left intact wherever possible; neither the middle turbinate nor the mesial wall of the ethmoid should be removed, except under the most urgent necessity.

In answer to a questionnaire, 52 leading rhinologists reported 80 deaths from meningitis following surgery in the ethmoid region; the middle turbinate was left undisturbed in only two of these cases, being removed entirely in 48 and partially in 21 cases, while it was injured by the evulsion in polyps in the remaining 9 cases. All but 15 out of 108 rhinologists stated that

(7) Arch. Otolaryngol., January, 1925.

they always removed the middle turbinate in whole or in part during intranasal exenteration of the ethmoids.

[One of the most frequent indications for operation upon the ethmoid is the relief of symptoms so frequently caused by hyperplastic ethmoiditis such as sneezing attacks, diffuse watery discharge from the nose, as well as asthma. The development of hyperplastic is apparently not infrequently induced because of the narrowness of the upper nasal passages in which the middle turbinal is wedged tightly in between the septum and the outer nasal wall so that even under careful shrinkage with cocain one obtains only a very incomplete view of the lower edge of the middle turbinal. In just these cases the resection of the concha media is not infrequently sufficient to bring about a marked improvement in symptoms by re-establishing normal ventilation of the ethmoid cells. In these cases, too, it is deemed advisable to do something more than the resection of the concha media, that is exenteration in part or completely of the ethmoid labyrinth, resection of the concha media constitutes the first necessary step to the operation upon the ethmoid itself.—Ed.]

End Results in Intranasal Sinus Operations. S. Lawwill[8] states that he is not yet convinced that the results from external nasal sinus operations are much better than those from the intranasal route. He does not believe that one is justified in attempting the external route until all other intranasal means have been tried repeatedly and failed. In support of his belief the author notes that some of the leading authorities of today have expressed themselves in just such a manner.

The writer reports 30 cases of paranasal sinus infection operated on by the intranasal route. Twenty were completely cured, four had to be operated on more than one time, and six were relieved of the symptoms of pain and toxemia only, the discharge continu-

(8) Jour. Tenn. State Med. Ass'n., February, 1925.

ing more or less unabated by the operative procedure. The cases ranged from six weeks duration to eight or ten years, and the cases which went uncured had been suppurating more than two years. While some of the uncured cases might recover following radical external operation, nevertheless, in some at least, the author feels it would be very dangerous, if not fatal, to attempt too extensive curettement of the sinus lining.

In view of the results obtained in the cases reported the author concludes that although the intranasal route is not all that could be expected of it, still it offers, with persistent after-treatment, almost the same results as the radical operations do and without the dangers, scarring and other unsatisfactory sequelae often attending the radical procedure.

[The fundamental principle underlying the relief and cure of a chronic sinusitis should always be kept in mind. This principle is that results obtained are for the most part dependent upon the establishing of adequate, permanent intranasal drainage, all of which can be satisfactorily done in most instances by intranasal work as by resorting to an external operation. It is in only such cases where intranasal drainage cannot be established by the intranasal route and where the symptoms, especially pain, persist, that one is called upon to resort to an external operation. Too often the resort to radical external surgery is confused in the minds of some operators with satisfactory end-results. An external operation is just as likely to require subsequent interference because of the failure to establish permanent, satisfactory intranasal drainage as is intranasal work.—Ed.]

Radical Surgery of the Maxillary Sinus: Study of 26 Postoperative Cases with Special Reference to Dental Injury. The so-called radical operation on the maxillary sinus may be performed either after Caldwell-Luc's or after Denker's method. E. T. Gatewood[9]

(9) Virginia Med. Month.; January, 1925.

feels that the latter is the method of choice, especially if the sinus is flattened in shape and the nasal wall bent in, as in that case the sinus cannot be properly cleaned out without removal of the crista pyriformis. It has been stated that patients subjected to these operations complain of constant numbness, sensation of elongated teeth, persistent pain or abscess formation with loss of teeth. But it should not be difficult to forestall such sequels by a careful technic.

Injury to the peridental membrane may be avoided by using a sharp chisel or, better still, the motor-driven burr. Breaking through the sinus floor overlying the dental root may be guarded against by using a dull subperiosteal separator instead of the curet. The nerve and blood supply is so well provided for in this region that permanent damage seems unlikely. Devitalization of teeth and apical abscesses are more probably due to injury of the terminal apical structure. This can be avoided by a slow and painstaking technic with block anesthesia.

The author's own series of 26 postoperative cases included two in which the interval between the operation and the electric and roentgenologic examinations was not long enough for any degree of nerve regeneration. Of the other 24 cases, 15 gave good normal nerve reactions with the minimal stimulation required for the opposite or control side. In the remaining cases the teeth gave a subnormal reaction under the same conditions; but time will probably complete the normal degree of regeneration. The *x*-ray examination proved negative in all but one of the 26 cases, in which there was an abscess at the second left bicuspid.

[The exenteration of the lining membrane of the antrum is not an essential feature for the cure of most cases of chronic maxillary sinusitis, but the establishing of a permanent, adequate intranasal drainage is essential. Operations upon the lining of the sinuses which

jeopardize the teeth are a radicalism which for most sinus disease are unnecessary.—Ed.]

Methods of Estimating the Activity of the Ciliary Epithelium Within the Sinuses. A. L. Yates[1] has carried out a series of investigations to estimate the action of the epithelium in normal and in infected cavities. He first selected cases where there was a considerable and constant discharge of mucus within the nose, but in which the mucus passed almost entirely in a backward direction. He attempted to find out the manner in which the mucus envelops the inspired micro-organisms by placing within the nose a few drops of 1 per cent. solution of indigocarmin. Later he substituted powdered indigocarmin or lampblack. The mucus picked this up and passed it on; in so doing the mucus was apparently rolled over and over, enveloping the coloring matter completely. In order to find the path which the indigocarmin followed from the sinuses, the author injected into the various sinuses a quantity of 0.4 per cent. indigocarmin solution in saline. Upon injection of 10 c.c. of this fluid into the antrum, if the sinus was normal the coloring matter appeared in the nasopharynx in about two minutes, and its path could be readily traced from the ostium of the sinus. A simpler method is to wash out a sinus on one occasion with liquid paraffin and on the next with saline; the amount of paraffin remaining furnishes some evidence of the ciliary activity.

The author concludes that the severity of a sinusitis depends upon the power of the mucous membrane to prevent its own destruction by the inspired micro-organism. If the property that the mucus possesses of preventing the passage of water, and hence of water-soluble toxins, is destroyed, a progressively increasing poisoning by these toxins of the ciliated epithelium occurs. As the ciliary paralysis increases, the secretion of mucus is also paralyzed until finally the micro-organisms come to

(1) Jour. Laryngol. and Otol., October, 1924.

dwell in a symbiotic state in the sinus, and the toxins are readily absorbed with the production of remote symptoms. The intimate relation of the tracts from the sinuses to the eustachian tube, on the one hand, and to the tonsil, on the other, suggests that tubal catarrh is a secondary manifestation of sinusitis and also that the initial enlargement of the tonsils is frequently due to sinusitis.

[The conclusion that tubal catarrh and tonsil infection are intimately related to the existence of a sinusitis is not justified. It is entirely proper to point out as the author does, that such is a possibility; however, clinical evidence that tonsil disease and tubal catarrh are caused by sinus infection is wanting.—Ed.]

The End-Results of Sinus Surgery in Children. J. J. Shea* states that the end-results of sinus surgery in children compare favorably with those obtained in adults. The initial improvement is generally gratifying, but the attainment of permanent relief is difficult, for the disease tends to be progressive and may be based on an inherited weakness. Radical surgery on the paranasal sinuses of children is seldom necessary, and, when instituted, requires protracted postoperative care, the same as radical mastoid surgery on the growing ear.

The author does not believe that surgical interference will stop the growth and development of the external nose or sinuses. Instead, by reestablishing the normal ventilation and drainage, through surgery, the sinuses will begin to grow again and in many instances regain their lost development. No damage to the growth and development of the teeth has been found to follow intranasal drainage of the antrums.

The most common operation in sinus surgery in children and infants is drainage of the antrum. The reason for this is that the antrum in children has the largest absorbing surface of any of the sinuses. The

(*) Arch. Otolaryngol., August, 1925.

author advises ether anesthesia wherever possible so that the operative procedures can be deliberate and thorough. After cleansing the nasal passage with 30 per cent. alcohol solution the antrum is punctured with a trocar, sterile water instilled and then removed by means of a sterile needle and syringe. The solution withdrawn is then placed in test tubes for culture.

In making the window resection an antrum trocar knife is inserted under the inferior turbinate. It is important to resect the window as far posteriorly as possible, as this insures a more permanent opening. This can be accomplished by having the back of the blade serrated and using it as a saw. With a rasp the anterior end of the window is enlarged. To facilitate continuous drainage a catheter is introduced into the antrum over a trocar; when it is in place the trocar is slipped out leaving the tube protruding from the window into the vestibule of the nose.

In the postoperative case a 10 per cent. solution of protargin is instilled through the tube into the antrum three times a day for about five days. The tube is removed on the fifth or sixth day as the window is well formed by this time. Subsequent irrigations of the antrum are made with a straight needle or curved trocar. The irrigations are continued until the discharge has ceased and are re-established any time drainage is impeded or if the opening has closed. The author advises irrigating the antrum at the end of any acute infection of the nose, in that it is not the amount of sinus discharge but the lack of drainage with absorption that poisons the child's system.

The writer discusses the results obtained in a series of children coming under his care. He emphasizes that the symptoms may often clear up after removal of the tonsils and adenoids, and these should be taken care of before resorting to the antrum drainage. However, in a number of cases the sinus operation is necessary to produce relief. The conditions relieved

by the author's procedure include: acute laryngitis and bronchitis, nephritis, pyelitis, myocarditis, asthma, arthritis, ozena, diabetes, cyclic vomiting and infections of the middle ear and mastoid.

[In view of the interest that has been aroused because of the ability to recognize sinus disease even in children by means of the skiagraph, it is important to bear in mind this fundamental fact, that a large percentage of all acute sinus diseases that occur at any age clear up spontaneously and that those which are protracted over a few weeks' time usually clear up under the simplest kind of local treatment applied to the antrum, namely, simple irrigation. Resection of the nasal wall is called for even in adults only in the more protracted cases and the necessity for radical surgical manipulations is reserved for the very exceptional case. For obvious reasons this rule is applied even more stringently when it comes to the question of operating in children where the palpable difficulties are so much greater.—Ed.]

Paranasal Sinusitis in Children. The average extent of paranasal pneumatization at birth, according to W. B. Davis,* is as follows: the ethmoid cells fill the lateral ethmoidal masses. The maxillary sinuses average 8.2 mm. anteroposteriorly, 3.3 mm. vertically, and 2.8 mm. laterally. The sphenoidal sinuses average 2.8 mm. vertically, 2 mm. laterally and 1.5 mm. posteriorly. Frontal sinuses are not present at birth. Thus, it is evident that paranasal pneumatization is, from earliest infancy, sufficient to make sinusitis a condition always to be considered.

Infections of the paranasal sinuses in children are most frequently due to acute colds, the acute infectious diseases, influenza and pneumonia. The author believes that sinus infections are much more apt to develop as complications or sequelae of these conditions in children who have previously had some persisting degree of intranasal congestion, due to hindrance of

(*) Atlantic Med. Jour., August, 1925.

drainage and ventilation by infected tonsils and enlarged adenoids.

The order of frequency of location in which infections occur in the sinuses is: ethmoidal, maxillary, sphenoidal, and frontal. The common symptoms are nasal discharge, some degree of nasal obstruction, frequently recurring colds, cough, epiphora, sometimes arthritic pains and occasionally epistaxis. Upon inspection there is usually mucopurulent or purulent infection in one or both nasal cavities. Most cases show enlarged infected tonsils and adenoids. *X*-ray examination by a competent roentgenologist is of great aid in making the correct diagnosis and also in demonstrating the size and extent of the sinuses. In the author's cases, bacterial examination has as a rule shown the usual organisms of the respiratory tract, with the pneumococci predominating.

Conservative treatment is usually all that is required in these cases. The congested mucosa is shrunk by an application of some mildly astringent oil solution, followed by 15 per cent. argyrol applied freely with a dropper every three or four hours. Atropin in small doses, administered internally, is very helpful. The author has found the use of mixed pneumococcic vaccines also of benefit. When the infection has passed into the subacute or chronic stage the tonsils and adenoids should be removed and the nasal treatment continued. The author emphasizes the importance of early treatment, which will usually prevent the necessity of later, radical surgical measures.

The surgical operations on the sinuses are not discussed, but the writer states that the object to be achieved is drainage and the maintenance of ventilation.

Sinusitis a Reason for Apparent Failure Following Removal of Tonsils and Adenoids in Children. The tonsil and adenoid operation is not the only method of procedure in the so-called chronic cold in children. R.

A. Barlow[2] states that there are some children whose general reaction to cold weather predisposes to colds. However, in the light of more recent investigation it is found that many are not cured of their head colds or bronchitis by tonsillectomy because of the existence of paranasal sinusitis. Medical measures are of little value in sinusitis; surgical drainage is the most rational procedure.

This condition has been observed in infants as young as 6 months. The acute manifestations, with purulent nasal discharge, usually subside in a few days, only to flare up when anything lowers the general resistance of the patient. The most common manifestation of chronic sinusitis is the mucopurulent discharges from the nose. The patient is treated for a head cold and is given all forms of expectorants and sedative cough cures, with the usual disappointing results. Thus it may be seen that a tonsillectomy would not drain the antrum and naturally such an operation would fall into ill repute as far as this type of case is concerned. Signs of focal infection, such as chorea, arthritis and iritis, may also develop. In later life the beginning of a condition resulting in nasal polyps, asthma and possibly hay-fever may be attributed to sinus infection in early life. Roentgenography is indispensable in these cases.

Acute cases of sinusitis are treated with steam inhalations with tincture of benzoin compound and the instillation of 10 per cent. argyrol or 1 per cent. mercurochrome. In chronic sinusitis, the removal of tonsils and adenoids should be done to eliminate these parts as irritative factors, but the sinus itself must be drained. The ethmoids may have to be opened also, but only when roentgenograms show involvement of those sinuses.

A good deal of attention has in recent years been devoted to the fact that young children not so infre-

(2) Jour. Mich. State Med. Soc., January, 1925.

quently acquire in connection with an acute head cold an infection extending to the membranes of the sinuses. The skiagraph has been of extensive assistance in reaching this conclusion. Such sinus conditions usually subside as the inflammation of the membranes of the nasal chambers themselves disappears. Frequently such individuals appear to be particularly susceptible to recurrences of acute infections of the nasal passages as well as of the sinuses. Situations of this kind rarely call for any further treatment than the simple local measures aimed toward the relief of a temporarily impaired nasal respiration by local applications. To resort to surgical interference for this form of sinus trouble in children is very rarely called for any more than there exists indication for operation upon the nose itself. This is rather fortunate because operative drainage of the sinuses which can be carried out in most cases rather readily in adults constitutes a rather delicate procedure in children for reasons that are all too obvious. One must not allow himself to draw the conclusion that because a child happens to be below par and susceptible to recurring infections of the nose and throat, a condition which is often relieved by the removal of diseased tonsils and adenoids, that in cases where these structures have been removed, there must exist some surgically correctible condition.—Ed.]

Alterations of the Optic Nerve by Lesions of the Nasal Sinuses. F. Mezzatesta[3] reports nine cases of optic nerve changes, of which two showed gumma of the sphenoidal sinus and the remaining seven showed tumors compressing the optic nerve in the region of the optic canal.

In Case 3 of this series, the tumor was an enchondroma of the sphenoid sinus, verified by operation.

Case 4 was a fibro-endothelioma, originating from the left maxillary sinus, invading the left side of the nose with blindness in the left eye and choked disk.

(3) Riv. Oto-Neuro-Oft., January-February, 1925.

This patient died two days after entrance into the hospital with suppurative meningitis. The author appends a complete necropsy report of this case.

Case 5 was one of neuritis, with incipient stasis by compression at the level of the optic canal from an endothelioma originating from the ethmoid and spreading to the sphenoid. This patient died and an extensive necropsy report is given.

Case 6 was also a case of endothelioma of the ethmoid spreading to the sphenoid.

Case 7 was a tumor of the left superior maxilla which had invaded the antrum and sphenoid.

Case 8 was a sarcoma of the sphenoid, originating from a sarcoma of the left masseter muscle.

Case 9 was a tumor of the sphenoid, propagated from the other sinuses.

Following a discussion of the pathological anatomy involved in these cases, the author concludes that:

1. The intricacy of connection between diseases of the sinuses and visual disturbances is evident. From the anatomic relations which the optic canal assumes with the pneumatic cavities of the face, the sinus which exerts the most harmful action on the nerves is the sphenoidal sinus and sometimes the posterior ethmoid cells. Also the other sinuses which have a greater extension than normal can become intimate with the optic nerve. The canal in general is separated from the sinus by a bony partition and variable thickness, which renders the spread of the lesions from one to the other more or less easy.

2. The visual disturbances which frequently at the beginning do not give any subjective sensations are defects and sectors of the visual field, in central or peripheral scotoma and principally in enlargement of the blind spot. Van der Hoeve's symptom (enlargement of the blind spot) must be detected by the perimeter of large radius such as De Vincentii's which has a radius of 1.20 meters and permits a greater precision.

Though Van der Hoeve's symptom is of great importance, roentgen ray examination is of the greatest importance in showing changes about the sinuses.

3. A bony wall by its thickness can always give a sufficient protection to the optic nerve.

4. For diagnosis, the symptom of Van der Hoeve, with roentgenographic examinations and the use of different angles and positions, is important to observe any variations in the projection of the sphenoidal sinus.

5. Early diagnosis is of the greatest importance. Delay is dangerous when there is compression exerted on the nerve fibers.

6. Ophthalmoscopic findings in the lesions of the sinuses can be the most varied; from an absolutely negative finding to neuritis and papillary stasis. Ophthalmoscopic examination must be aided by other examinations, field of vision, and so forth.

7. The mechanism of action of the visual disturbances in diseases of the sinuses is ordinarily that of compression. The author says he has never found direct participation of the nerve in the neoplastic process in cases of tumors. Papillary stasis is a mechanical phenomenon of compression and not of infiltration, according to the theory of Schmidt-Rimper.

Observations of 101 Cases of Nasal Infection, Exclusive of Diphtheria, in Children. W. A. Krieger[4] first reviews the development of the nasal accessory sinuses. The maxillary sinus is evident about the seventieth day of fetal life. After the fifteenth year it may be considered as of adult size. As a rule one cannot be certain of the frontal sinus until the sixth to the twelfth month of postfetal life.

The sphenoidal sinus is genetically demonstrable as early as the fourth month of fetal life. However, by the end of the third year the rudiment of the sphenoidal sinus is surrounded by bone save ventrally toward the nasal fossa where an opening, the primitive

(4) New York State Jour. Med., Feb. 13, 1925.

ostium sphenoidale, exists. During the fourth year it becomes the primitive sphenoidal sinus. The dorsolateral aspect of the sphenoidal sinus may thus early come into intimate relationship with the ophthalmic and maxillary nerves and be a potent factor in childhood neuralgias of the trigeminal nerve, even as early as the third year. Moreover, the pterygoid (Vidian) canal with its contained nerves and vessels likewise early—sixth or seventh years — establishes close relationship with the developing sphenoidal sinus. It is obvious that the sphenoidal sinus is early of importance clinically and that by the second or third year has assumed proportions sufficiently large to become the seat of pathologic processes and to retain infectious material in its cavity.

The initial ethmoidal out-pouchings are in evidence as early as the fourth month of fetal life, by the seventh month the evaginations have taken shape in the form of hollow tubular-like, blindly ending sacs, with ostia in communication with the points of initial outgrowth. These tubular sacs may be truly said to be ethmoidal cells.

The question of nasal infection in children is thus seen to be very important when the early development of the sinuses and their relation to the nasal mucous membrane and lymphatic supply is recognized. The author points out the necessity of taking care of the nasal infections before resorting to tonsil and adenoid removal. Frequently the operation is rendered unnecessary by persistent nasal treatment. It has also been shown that the operation often fails to relieve the child's symptoms.

The author illustrates these points by citing a series of case histories: Cough was the prominent symptom in 21 cases. Recovery was complete under nasal treatment. Temperature was the predominant symptom in 38 instances. Enlarged cervical glands occured in 18 cases, malnutrition in 9, ocular disturbances, mainly

inflammations of the lids or conjunctiva and cornea in 6 cases, and asthma in 9 cases.

In the treatment the author finds nasal suction the most important factor. After thorough cleansing of the nose an application of some silver preparation is advocated (silvol 10-15 per cent. or argyrol 25 per cent.), or in severe cases iodin may be carefully applied. For home treatment the author mentions nasal irrigation with normal saline followed by instillation of a bland oil spray, and in addition the internal administration of cod-liver oil, iron or arsenic.

[A very sane discussion of the infections of the nasal sinuses in children, and the treatment necessary in such cases.—Ed.]

The Nasal Sinuses as a Route of Infection in Encephalitis Lethargica. Four main types of inflammation of the nasal mucous membrane are recognized by A. L. Yates and S. Barnes.* In Type 1 the secretion consists of clear mucus, and the cilia are either active or are fatigued by the additional work necessary to remove the mucus. Type 2 is similar, but the inflammation is of a higher degree, with the result that mucopus is formed. Type 3 consists of fermentation of the mucus by the micro-organisms contained within it, so that it is thin and partially toxin-permeable, as a result of which bacterial toxins reach the mucous membrane, causing congestion of this. In Type 4 the mucous membrane is pale, the ciliary action is paralyzed, the mucous secretion absent or represented by a thin whitish coagulum or by a fluid material.

In an examination of 23 cases of encephalitis lethargica the authors found this type of inflammation in or around the sphenoid sinus in all. Seven of the cases gave a history of acute rhinitis following sinus pain, generally associated with some degree of ill-health. In the patients who developed encephalitis after suffering from a chronic and intense rhinitis for some

(*) Lancet, July 18. 1925.

years, bacteriological examination in almost all cases showed the presence of either Friedlander's bacillus or the pneumococcus, and the well-recognized chronicity of the nasal infection when these organisms are present affords an explanation of the occurrence of Type 4 sinusitis in these cases.

The heightened absorptive power of the mucous membrane can be demonstrated in Type 4 sinusitis by injection of either solutions of indigo-carmine or of phenolsulphonephthalein into the sinuses. It will appear in the urine, taking about twice as long to do so as if it were injected into a muscle, but not appearing in the urine in cases of sinuses lined by relatively normal mucous membrane.

The authors thus suggest that the infection in encephalitis (and possibly other central nervous infections) is a symbiotic process; that in the first place the mucous membrane is damaged by one of the catarrhal group of organisms, and that subsequently the virus of encephalitis is inhaled, passes through the damaged mucous membrane, and is absorbed into the brain via the peri-neural lymphatics.

Some Points in the Differential Diagnosis of Focal Infection in the Nasal Sinuses Causing Ocular and Other Systemic Infections. According to P. Watson-Williams* it is of considerable importance to obtain reliable diagnostic findings of the presence or absence of sinus infection in cases of canalicular optic neuritis and other peripheral neuritis, rheumatoid arthritis, neurasthenia, mental depression, and even insanity.

The use of transillumination and skiagraphy often give unreliable or doubtful findings. In order to come to more definite conclusions the author has developed a sterile suction method of examination for each of the sinuses. A separate sterile syringe and cannula is used for each sinus. After entering a sinus a little sterile warm water may be injected to mix with any

(*) Bristol Med.-Chir. Jour., Vol. xlii, No. 156, 1925.

discharge lying in the cavity, and then sucked back into the syringe. After detaching the cannula, the contents of the syringe are emptied into a sterile bottle for examination by stained film and culture.

The maxillary antrum may be entered either through the inferior or middle meatus (Figs. 53 and 54). The sphenoid sinus is entered by passing the blunt trocar and cannula through the thin anterior wall. The posterior ethmoidal cells are best explored by piercing the cell walls beneath the attachment of the middle turbinate to the outer wall of the nasal passage.

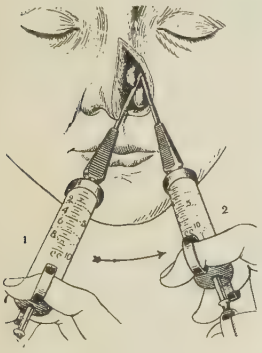


Fig. 53

Fig. 54

Fig. 53.—Diagram with left nasal passage exposed to show exploration of left antrum through the middle meatus. (1) First position, the curved end of cannula placed in the middle meatus. (2) Second position prior to passing cannula down and outwards into the antrum on raising the hand and syringe upwards.

Fig. 54.—Showing above the cannula passed into the maxillary antrum through the middle meatus, and below the same with the short cannula through the thin inferior antromeatal wall.

Having thus explored the sinuses on both right and left sides of the nose, at least six samples are obtained which should yield exact and reliable information as to the condition of each sinus. The author believes that examination of the frontal sinuses can be carried out successfully by skiagram or by blowing any secretion from the sinus after the passage of a fine cannula, the special technic described not being necessary in

the case of this sinus. In conclusion the author mentions the several anatomical variations of the sinuses and the technic necessary to overcome them.

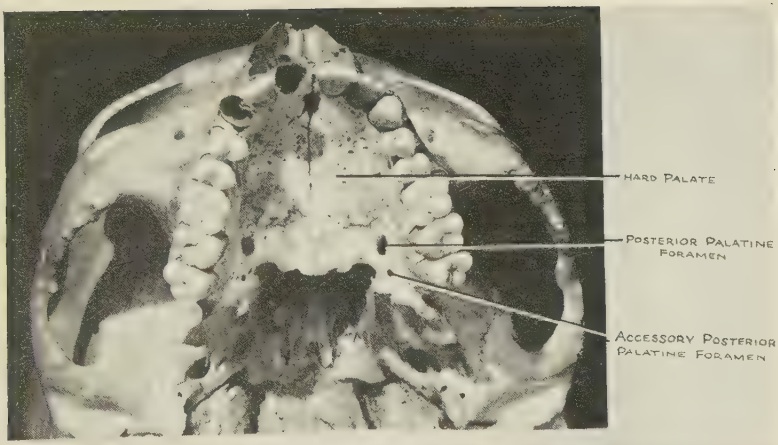
The Sphenopalatine Ganglion

Contributions to the Study of the Sphenopalatine Ganglion. Sphenopalatine ganglion disturbance must not be considered as an entity, but rather as a combination of four different factors: a trigeminal maxillary syndrome, a sensory facial nerve syndrome, a sympathetic syndrome and a local sphenopalatine ganglion syndrome coming from the cells located in the ganglion proper. Usually combinations of these syndromes occur. In considering the symptomatology of sphenoid, ethmoid and antrum disease one often finds all three, giving the same symptomatology, thus making a diagnosis based on symptoms unreliable. It is obvious that all three will produce their symptoms through the same ganglion and thus give clinically the same picture.

The surgical importance of the ganglion has received little emphasis. It occured to S. L. Ruskin[5] that the ganglion could be injected through the posterior palatine canal (Plate XIX, A). The author has produced anesthesia by this route in operations on the tonsils, antrum, ethmoid and sphenoidal sinuses, and the nasal septum.

The technic consists first of cleansing the patient's mouth and painting the region about the palatine foramen with half strength solution of iodin. For anesthesia 1 per cent. novocain with adrenalin is used. The patient should be warned against closing the mouth; or a mouth gag may be used. The author employs a 22 gauge platinum needle, 45 mm. long, mounted on a syringe at about a 45° angle

(5) Laryngoscope, February, 1925.



HARD PALATE SHOWING POSTERIOR PALATINE FORAMEN

A

B

A—Injection of ganglion.

B—Needle syringe, 22 gauge platinum.—Ruskin, page 378.

(Plate XIX, *B*). With the patient in the lying position and the head extended, the canal, which is almost vertical in the sitting position, is brought into a plane 45° to the horizontal. In this position the author found injection easiest, although it can also be done in the sitting position. To enter the canal one first locates the posterior palatine foramen. This opening is usually round, quite large and lies opposite the second molar tooth. The edge of the hard palate should be palpated and the needle inserted 5 mm. anteriorly and about .75 cm. medial to the second molar tooth.

In edentulous mouths one is of course guided more by palpation of the hard palate. In these cases, however, the posterior palatine foramen is large, thus making it relatively easy. The posterior palatine foramen varies in its position. Sometimes it is opposite the last molar tooth or it may be oval in shape and quite close to the alveolar process. One is therefore obliged occasionally to probe with the needle to locate the opening.

Another guide to the foramen is an occasional dimple in the mucous membrane of the palate in this area. This dimple is sometimes redder or paler than the surrounding membrane. If one goes behind the posterior edge of the hard palate the needle slides in easily, but instead of being in the canal it has merely perforated through the soft palate and the fluid runs into the pharynx or appears mixed with blood in the nose. If the needle was placed through the soft palate more laterally it will slide along under the mucous membrane of the lateral wall of the nose and the fluid will be deposited in the vicinity of the sphenopalatine foramen. In such event anesthesia of the ganglion would occur by infiltration.

The needle is inserted through the posterior palatine foramen into the canal to a depth of 3.5 to 4 cm., when its point will be directly in the ganglion. An additional 5 mm. more brings it just medial to the maxil-

lary nerve, which can then be injected if necessary. The procedure, while simple, nevertheless requires a certain amount of practice and skill.

The author lists the large number of conditions which have proved amenable to the ganglion injection; and states that no doubt more conditions will be found which can be relieved by this method. Several unusual cases are reported.

Some Rhinologic Observations. Within the last few years G. Sluder[6] has observed some cases which do not fit in the category of phenomena that could be recognized as due to pathology in the region of the sphenopalatine ganglion, and yet they have been controlled by cocainization of the ganglion. The following types of cases are mentioned: (1) external cricoidynia; (2) lower jaw toothache; (3) glossodynia; (4) earache in cases of eustachian tube and middle ear lesions; (5) earache secondary to cancer of the larynx; (6) the pain of laryngeal tuberculosis; (7) the pain of herpes of the shoulder; (8) relief of spasm of the esophagus (not reported); (9) relief of spasm of the face and upper respiratory tract; (10) all syphilitic headache; (11) malarial headache (unreported), and the control of ophthalmic migraine.

These phenomena occurred in cases in which there was no lesion in the ganglion district, but were relieved through the nasal ganglion. Other parts of the nose and throat were always cocainized as a control in estimating the psychic effect of cocain and the part of the trigeminus might have played, with negative result.

Other phenomena, to wit, (12) lumbago; (13) intercostal pain (neuralgia), gastric pain, nausea and diarrhea, and (14) nodular headache have occurred in patients in which a definite lesion existed in the ganglion district, and were relieved through the ganglion

(6) Jour. Amer. Med. Ass'n., Nov. 8, 1924.

(by cocainization or surgery). The same control experiments were performed.

Aside from the olfactory and the nervus terminalis there are three sources of nerve supply for the nose: 1. The trigeminus, first division through the anterior ethmoidal or nasociliary nerve; also the second division through branches from the nasal ganglion. 2. The seventh through branches from the nasal ganglion. The ganglion gets this supply through the great superficial petrosal, a branch from the geniculate ganglion of the seventh. 3. The involuntary nervous system, which sends a supply (cranial autonomic) through the great superficial petrosal to the nasal ganglion. The great deep petrosal sends a sympathetic supply from the carotid plexus.

Explanation of the phenomena mentioned above is difficult or impossible with our present knowledge of the nervous system. Elimination of the general effect of cocain seems to have been satisfactory. In this connection, one naturally thinks of the trigeminus and the afferent properties of the facial with their segmental overlappings. But in thinking of the trigeminus as a means of explaining any of these phenomena, it is hard to understand why cocainization of the anterior ethmoidal, a branch from the first division, should not give the result, as well as cocainization of the fibers from the second division that are found in the nasal ganglion. It is also difficult or impossible to understand how cocainization of a sensory nerve at rest can influence, by its segmental overlapping, motor and sensory phenomena in more or less remote parts of the body. This is equally true of the fibers of the seventh nerve, which transmit the deep sensibility of the face.

[The author's observations that conditions in the body quite remote from the sphenopalatine region are symptomatically relieved by the injection of the ganglion reminds one of the enthusiastic students of the wide

flung results of nasal reflexes which filled the literature on rhinology in the '80s. There seemed to be at that time those who were willing to believe that there existed scarcely any condition in any part of the body which was not under the influence of the so-called nasal reflexes, reflexes which were dependent not alone upon tangible evidences of pathological conditions in the nasal passages, but upon the ordinary anatomical variations such as the irregularities of the septum and intangible spots located here and there in the mucous membrane, especially over the turbinal bodies. The conclusions arrived at by these men working in the '80s have long since been discounted. It remains to be seen whether the observations made by the author can be substantiated by other as competent observers and whether anything more permanent will be established than remains of the old theories of nasal reflexes.—Ed.]

Pain in Area of Fifth Nerve. Aches, pains and unpleasant sensations are common enough in the structures supplied by the fifth cranial nerve. No manifest cause can be discovered for the complaints of a certain group of patients, even when the painful area has been examined by the best methods known to modern science. The area lies in the domain studied by the ophthalmologist, otorhinologist, stomatologist and other allied scientists. The patient is frequently referred to the neurologist for a final opinion when neither investigation nor treatment has succeeded in satisfactorily explaining the cause of the pain. Often the condition may be diagnosed "neuralgia" or "neurosis," and the neurologist must explain the situation and treat the patient, a complex problem and worthy of a free discussion, for many such cases are extraordinarily difficult to interpret, and the classification in use is vague and obscure, and not based on accurate scientific foundation.

According to H. L. Parker[7] there remains a vast col-

(7) Jour. Amer. Med. Ass'n., Nov. 23, 1924.

lection of pains, aches, paresthesias and disagreeable sensations for which no explanation has been discovered.

Certain pain syndromes are so stereotyped in character, so constant as to symptoms, and so similar as to course, that one must inevitably recognize a definite disease entity, even though the underlying lesion is not known. Paroxysmal trigeminal neuralgia comes under this category, and after seeing a great many patients with this disease, one is impressed by the relative sameness of their complaints.

The disease entity called migraine is much more common than paroxysmal trigeminal neuralgia; its etiology is uncertain, yet it is so common and has so many constant features that it can quite properly be classified under one common name. Perhaps the most conservative of criteria in making the diagnosis would be the hereditary character, the onset early in life, the periodicity of attacks, and the lengthy course over the major portion of a patient's lifetime without, at any time, evidence of structural alteration of the tissues.

With a sharply localized pain in the area of the fifth nerve, there must always be a temptation to attempt to cure it by abolition of the functions of the nerve. It is argued that with anesthesia there can be no pain, and that the patient will not suffer from having an anesthetic area in place of the original dolorous one. While this is eminently suitable treatment for paroxysmal trigeminal neuralgia, it is quite the reverse for migraine. In such cases, patients react violently to any operation on the peripheral branches of the nerve or its posterior root, and complain that their pain not only continues after complete anesthesia is produced, but that there is also a riot of unplesant sensations in the area, which is found by examination to be completely anesthetic. There is marked nervous exhaustion, anxiety and mental depression, which tends to be more or less permanent.

Patients who have had many and multiple operations on the face, jaws, tongue and accessory sinuses are seen from time to time at all big centers of medical activity, to which chronic cases drift in the course of time. For want of a better name, the condition of such patients has been classified in the clinic as "the syndrome of multiple operations." While it is obvious that no further surgery can help such patients, the proper interpretation of their complaint and its final cure is by no means simple. Only by an intelligent understanding of the initial step in the unhappy career of such patients is it possible to arrive at any feasible explanation. One must appreciate the patient as a whole, in the psychic, as well as the physical sense, and not as a certain anatomic structure attached to a nondescript lay figure of no practical importance. Most of these patients are extremely neurotic; whether they were always so is a different question. While some of them are undoubtedly inadequate to stand the ordinary strain of life, and so adopt a career of chronic invalidism, this is by no means the case in all. Many such persons are quite capable of carrying out their daily functions in spite of the trouble that so many physicians have tried to relieve. With this type of person, one is tempted to conjecture as to the local disease missed in previous investigations, and to suggest more radical treatment of the areas where the pain is felt. However, one fact, impossible to ignore or overlook, is the extensive mutilation of anatomic structures, with increasing trouble after each procedure; the more such patients are operated on, the worse they become.

Referring to the original symptom that led to the first operation, a relative sparsity of evidence of severe disease will be noted, the complaint being inevitably out of proportion to what was revealed by the first operation. The question of individual sensibility to pain stimulus is a hard one to answer. Unquestionably this sensitivity varies enormously, and the response of

different persons to irritation varies in degree. The threshold of pain stimulus varies from person to person throughout the periods of life. It takes an expert diagnostician to evaluate the intensity of any disagreeable sensation; in order to do this, he must know the person who is feeling the pain. The psychology of a patient is taken more into consideration when a prolonged operation is contemplated, and when milder, though less efficient, treatment is available. The patient is judged as a good or bad operative risk; if, however, the operation is trivial, involving no risk to the patient, such consideration is likely to be neglected, and it is only after a series of unsuccessful operations around the face, jaws or sinuses that the operator realizes he has a distressing problem on his hands. The patient is then called a neurotic, disappears from observation, and solicits aid elsewhere.

The author cites a number of cases illustrating the conditions discussed.

[A sane discussion of the problem which has too often received mistreatment at the hands of the rhinologist where with insufficient evidence of any sinus involvement, an operation is recommended for the relief of pain and headache which become all too apparent after the operation were not dependent upon the suspected nasal condition. One of the outstanding abuses in rhinology is the undertaking of operations, particularly on the sinuses, by men who have not been adequately trained to recognize indications for sinus operations.—Ed.]

Miscellaneous Nasal Conditions

Congenital Nasal Atresia. The cause of congenital atresia of the choana is somewhat in doubt, but it is believed that the primitive nasal capsule which develops as a part of the primordial cranium, and which

extends forward beyond the anterior portion of the notochord, forms a core for the frontal nasal process, producing a broad mass of tissue changed in form somewhat which approximates the lateral nasal and maxillary processes. By this approximation of the nasal structures, the ectodermal coverings are brought abnormally into contact, the processes become united and the atresia results. This all occurs in the early months of the intra-uterine life during the formation of the fetal head.

According to F. L. Rogers[8] nasal atresia is believed to be much more common than the present available literature would indicate. Some writers who have made an intensive study of the subject state their belief is that many deaths at birth, or within the first 48 hours after birth, where the cause of death is not positively known, are attributable to this form of asphyxiation. If this be true, the subject is one of very much greater importance than has heretofore been regarded, and offers added reason for bringing the subject to the attention of the profession, particularly to obstetricians, general practitioners as well as the rhinolaryngologist.

Richards says mouth-breathing is always an acquired habit. Hence, a child born with complete nasal obstruction almost immediately becomes cyanotic and in distress cries. The crying establishes mouth-breathing, which temporarily relieves the cyanosis. When the child stops crying it soon becomes cyanotic again, and it frequently becomes necessary to aid the child's early respiratory acts by mechanically elevating the soft palate and pulling the tongue forward, repeating the practice until the mouth-breathing habit is acquired.

When one nostril is occluded, the patient may not manifest the most marked symptoms of obstruction. Where atresia is complete on both sides, mouth-breath-

(8) Calif. and Western Med., April, 1925.

ing is the most conspicuous symptom. The persistent presence of secretions of a peculiarly opaque mucilaginous consistency in the nose which cannot be expelled by blowing the nose, or the appearance of a watery discharge from the nose when the child cries from increased lachrymation, should always suggest the presence of congenital nasal atresia. Headache, deafness, and anosmia are said to exist in most cases. The presence of adenoids, polypi, or other tumors benign or malignant, should always be determined and ruled out in every case of suspected atresia.

The treatment of congenital atresia is fundamentally surgical. Authorities differ somewhat as to the time of choice, varying from the first to the tenth year. A majority agree that it should be undertaken as early in life as there is sufficient development to admit the operator's forefinger into the nasopharynx, and the nostril large enough to admit of visualizing the field of operation and the use of instruments required in the nose at the point of occlusion. The author reports three cases coming under his observation and gives his technic of operation in one of the cases.

[Most cases of atresia of the choanae appear to be unilateral. This may be due to the fact which the author points out that cases of bilateral atresia succumb in infancy because of the inability to take nourishment. The statement that deafness is a common finding is not correct. Observations have been made that tubal catarrh and middle ear disease are noticeably absent in cases of congenital atresia. Operations are difficult and often unsatisfactory as it is very difficult to keep the opening patulent when once it has been made. Where a unilateral atresia exists a satisfactory relief from the symptoms, especially the retention of secretions which cannot, of course, be expelled by blowing, can be accomplished by making a large opening posteriorly in the nasal wall.—Ed.]

Dacryostenosis Following Ozena Operation and Its Cure. A case is reported by J. Maliniak[9] of a young woman, upon whom Halle's operation for ozena had been performed. Following the operation the patient developed a chronic dacryocystitis on the operated side. It was for this that the author saw the patient and after consideration he performed the endonasal tear sac operation. The patient finally recovered completely from the condition.

The author considers the various operations for ozena and discusses the anatomy of the lachrymal sac and duct. From these considerations he comes to the following conclusions:

1. Some of the new surgical methods practiced for the cure of ozena endanger the integrity of the lachrymal duct.

2. This is due to the close topographical relations of the lachrymal apparatus with the nasal fossae.

3. Methods in which the lateral nasal walls are infractured and mobilized are particularly dangerous.

4. Methods in which the narrowing of the nasal fossae is performed by submucous transplantation of bone or cartilage are entirely safe in this respect.

5. The endonasala tear sac operation gives the best results in cases of dacryostenosis. It is not contraindicated in infected nasal fossae.

Calcium and Parathyroid Glands in Relation to Hyperesthetic Rhinitis. R. Sonnenschein and S. J. Pearlman[1] review the current ideas in regard to the value of calcium and glandular therapy, and the fixing of ionic calcium in the blood by the ultra-violet ray. They come to the following conclusions:

1. It is doubtful whether the blood calcium content is the only one and essential factor in the causation of hyperesthetic rhinitis, since none of the cases in the writers' series of clear cut instances showed a definite

(9) Laryngoscope, April, 1925.
(1) Jour. Amer. Med. Ass'n., Dec. 20, 1924.

deficiency, and the quoted statements of others point to similar findings.

2. Ultra-violet ray radiation may be beneficial; further trials are needed to prove this point conclusively.

3. Calcium intravenously probably acts as a sedative, and this gives temporary relief in many cases; its action when given by mouth is undetermined.

4. There is little evidence that in man, at least, parathyroid feeding is of any value.

5. Thyroid is probably of value only in cretinism and acquired thyroid deficiency, surgical or otherwise. Taken in large doses, it has a tendency to raise the metabolic rate. This is not a desirable feature, especially with reference to hyperesthetic rhinitis, since it has been definitely shown that a lowered metabolism is not usually present in this condition. It is doubtful, therefore, whether it has any value in hyperesthetic rhinitis even when used as an adjuvant to calcium or parathyroid. The writers emphasize once more the desirability of using only one medicament or therapeutic measure at a time in order to arrive at a definite conclusion regarding the value of calcium, parathyroid, thyroid or ultra-violet radiation in the treatment of hyperesthetic rhinitis.

Some Considerations of So-Called Nasal Catarrh. In this article H. H. Vail[2] defines catarrh as an inflammation of a mucous surface with a free discharge. A rough survey of comparative anatomy is very interesting. In fishes the nasal organ is entirely olfactory, there being a complicated system of folds of the mucous membrane which are supplied by the olfactory nerve.

As we go up in the scale in amphibians, the nasal chamber becomes differentiated into an olfactory and a respiratory function and extension of the olfactory surface takes place by the formation of one or more

(2) Cinn. Jour. Med., November, 1924.

prominences on the floor and sides of the nose which may be compared to the turbinals or higher forms. The nasal chamber is converted into cavities in all cases so that we have the first development of the nasal accessory sinuses which in the amphibians usually consists of an accessory cavity situated in the maxillary bone and in some species this accessory cavity becomes entirely shut off from the main nasal cavity and receives a special branch of the olfactory nerve. Thus in these species two separate nasal cavities can be distinguished.

In reptiles the nasal cavity is divided into a small anterior portion and a large posterior or olfactory portion. In crocodiles each nasal chamber is divided posteriorly into two superimposed cavities, the upper of which represents the proper olfactory chamber while the lower functions as a respiratory portion. In all birds there is an outer respiratory chamber with the olfactory chamber situated above it.

In mammals the nasal cavity becomes much larger. Turbinates are present and cell-like compartments are found with olfactory ridges or scrolls extending into the nasal cavity. These scrolls belong to the true olfactory region and are generally described as ethmoid turbinals. The maxillary turbinal loses its olfactory epithelium and the nasal chamber in mammals usually communicates with the neighboring accessory cavities which are the maxillary, frontal, and sphenoidal sinuses. In some mammals the frontal and sphenoidal sinuses lose their primary function of olfaction. In man the nasal chamber is given over entirely to respiration except for a comparatively small area of special olfactory mucous membrane in the region of the superior and upper portion of the middle turbinate.

Thus, it is seen that the nasal sinus mucosa has degenerated from the highly specialized tissue absolutely necessary to the lower animals to a function in man which so far as can be made out is nil. Certainly

the mucosa of the sinuses with its deficient circulation, flat epithelium and scanty mucous glands cannot warm and moisten the inspired air. Therefore as a result of the loss of its special function this mucous membrane is of no practical value to the human organism and the logical thing results, just as in the human appendix. The mucous membrane of the sinuses becomes subject to slight disease in a way that specialized or functioning membranes would not be and when there is added to the natural susceptibility of the membrane anatomical deformities that handicap the free ventilation and drainage of the sinuses it is obvious why nasal catarrh is so prevalent and difficult to cure.

The sinus mucosa is provided with cilia which carry the secretions and bacteria from the sinuses backward to the nasopharynx and granting there are no anatomical obstructions or severe infections the nose can keep itself fairly clean and practically sterile in its deepest recesses. Add to this normal functioning nose a gradual or suddenly developing pathology resulting from anatomical causes such as a deviated septum or enlargement of middle turbinates through the gradual growth of turbinate ethmoid cells the nose is unable to carry out the proper measures to keep itself clean and there results a residual infection which is added to from time to time as bodily resistance is lowered and changes in the climate conditions occur and very soon a vicious circle is established and so-called catarrh is obviously present.

Early treatment is most desirable. The logical procedure is first of all early surgical correction of anatomical deformities. Conservative surgery on the nasal septum, middle turbinates and nasal sinuses offers the best relief. Along with surgery local treatment should be carried out, aided by vaccines and climatic changes where practicable. As local treatment the author mentions the use of mild saline irrigations,

adrenalin inhalant drops, stimulating oil sprays, and applications of silver nitrate.

[Nasal catarrh in the sense in which the author uses this term is a symptom which is associated more or less with a variety of pathological conditions. Postnasal dropping is one of the most usual phenomena. The most frequent single cause for this is the condition of atrophy which in varying degrees is found so frequently in our intranasal examinations. The internists looking for focal infections often come to us with the feeling that this postnasal catarrh complained of by the patient must point toward some focal disease about the sinuses. As might be expected, the rhinologist whose preparation is largely one of an operative character readily falls in with this suggestion, and not able to recognize the conditions, especially around the ethmoid which may require operative interference, steps in and undertakes so-called drainage of the ethmoid, all of which only increases the abnormal secretions which are dependent primarily upon the nasal atrophy.—Ed.]

Clinical Observations of the Border-Line Between Dentistry and Otolaryngology. The border-line between the fields of otolaryngology and dentistry is frequently a hazy one and not easily determined. According to F. T. Hill[3] the pathology encountered in the patient frequently calls for the collaboration of both the dentist and the otolaryngologist. Otalgia, toxemias from focal infection, or inflammatory reaction about the eustachian tube orifices may be due to dental infections.

In the field of rhinology, the frequency with which deviations of the nasal septum are encountered points to the need of early corrective work on the teeth and palatal arch. Fully 88 per cent. of the Caucasian race are said to have deflections of the septum. These generally become manifest about the age of adolescence, and very frequently are due to faulty dental and pala-

(3) Maine Med. Jour., November, 1924.

tal development. Here is where orthodontia can play a large role in the field of prevention. By it, the child may be assured of future correct breathing and the nasal normality which is so vital a factor in the general health of the individual. And oftentimes the dentist, in turn, may well attribute the cause of the faulty arch to the presence of adenoids in the nasopharyngeal vault.

Of the accessory nasal sinuses, the maxillary antrum is the one in which the otolaryngologist and the dentist have a common interest. The author deplores the draining of an infected antrum through the alveolar process, even though it be the most dependent portion where gravity will have its greatest effect. Normally the antrum opens into the nose and, if drainage is desired, it should be secured into the nose and not the mouth. It is known that many times the antrum is opened and irrigated through the dental socket and that many times these cases heal satisfactorily. Often this method will suffice where the lining mucosa is not seriously infected, but the author believes that this course is not only ill advised, but is, in fact, dangerous, where there is any infection in the sinus *per se*. The chances of extension of infection, together with the establishment of a fistulous tract, are too great to be neglected. Drainage in these cases should be established through the nose, generally by an opening in the inferior meatus underneath the inferior turbinate. Here the otolaryngologist should be called upon.

Where the antral floor has become necrotic, where a tooth or sequestrum is acting as a foreign body, in the presence of a dentigerous cyst, or where, through long-standing infection, the lining of the sinus has become badly diseased and undergone degenerative changes, then a more radical procedure, such as the Caldwell-Luc operation, is indicated. But here, after thoroughly removing the diseased bone or mucosa, or both, the approach through the canine fossa should be carefully

sutured and drainage and ventilation instituted through the inferior meatus of the nose. Caution on the part of the dentist not to extend his procedures too far, and readiness to call on rhinological assistance, will save him many worries and the patient much discomfort and suffering.

In the mouth and pharynx the dental and otolaryngological factions more or less intermingle. The various infections of the buccal mucosa and the gums come equally to the attention of the dentist and the otolaryngologist. Gingivitis, stomatitis, cancrum oris or noma, as well as the parasitic infections, such as thrush, with its flaky deposits and dry mouth, call almost equally for dental and medical treatment. Proper dental therapy, together with appropriate medical treatment, general quite as much as local, are necessary to effect relief. Tartar deposits, pyorrhea, abscessed and carious teeth usually play a big part in these mouth infections. Malposed, unerupted or supernumerary teeth may prove to be vital factors.

In cases of infection of the salivary glands—the parotid, submaxillary and sublinguals—the possibilities of the dental factor must never be lost sight of. Again an abscessed or carious tooth may be the underlying cause. Cheek bite, due to malposed or pathologically occluding teeth, may give rise to disturbances of Stenson's duct, which may simulate a parotitis.

Diffuse suppuration of the floor of the mouth, known as Ludwig's angina, may be a most serious condition, extending down the neck and requiring quite heroic measures, not only to relieve, but to prevent an untoward end-result. While usually not of dental origin, these casese frequently are first seen by the dentist, who should recognize the severity of the condition and refer them as early as possible to the physician. The brawny induration in the neck just below the chin, the characteristic position of the head, held somewhat backward, due to the swelling and its pressure upon

the respiratory channel, and the swelling and edema of the tissues in the floor of the mouth underneath the tongue, should make the diagnosis easy. The larynx must be observed for edema. Tracheotomy may be required. External incision and drainage, early in the course of the disease, is advisable.

The ulcerations caused by the Vincent spirilum and fusiform bacillus are probably most commonly seen upon the tonsils, but they are also encountered on the soft palate, buccal mucosa and the gums. The character of the ulcerations usually makes the diagnosis fairly easy, though syphilis and sometimes diphtheria must be excluded. The very sharp edges, often angulated, with the deep excavations and the slough or membrane is quite diagnostic, while the bacteriological examination proves the case. There are innumerable methods of treatment, but the author has had the best success with applications of a freshly made 40 per cent. solution of silver nitrate after the slough or membrane has been gently removed by a cotton-stick or curette. This should be done daily. The teeth should be cleaned and all dental pathology remedied, and the tonsils, if the site of the infection, should be removed after the process has quieted down, in order to effect a final cure.

Pyorrhea, carious or abscessed teeth, as well as pathological dentition, may be causative factors in either acute or chronic pharyngitis. They may cause the exacerbation of a chronic diseased tonsil to an acute attack. They may be the underlying cause of a catarrhal laryngitis, and any endeavor directed at the attainment of a normal nose and throat will fail if due care is not exercised to remedy any existing dental pathology. Singers especially should have the most exact care taken of their teeth. Some neglected bit of pathology here may later cause considerable damage to the delicate mechanism of the larynx.

[The reference to the irregularities of the nasal sep-

tum needs perhaps some elucidation from the standpoint of the rhinologist. It is exceptional to find a septum without some irregularities such as deviations, spurs, ridges, etc. Entirely too much importance has been attached to these anatomical variations. The two proper indications for correction are when these irregularities interfere with the carrying out of proper operative work on the sinuses, including the ethmoid, and when the deflection of the septum is causing sufficient obstruction to produce annoyance in nasal respiration. Highly arched palates do not appear to be any more frequently associated with these irregularities of the septum than all flat, broad arches. On the other hand, it remains true that the broadening of the arch sometimes brings about an improvement in the symptom of nasal obstruction.

We are quite in sympathy with the author's views regarding the proper method of handling antrum infection. Where this is of dental origin the first thing to do is to have the local infection caused by dental origin properly taken care of. Most cases of antrum infection, however, have their origin in the extension of infection in the nose. In all cases, the proper remedy after the dental infection has been taken care of is to provide proper permanent ventilation and drainage between the antrum and the nasal cavity. Sometimes this can be accomplished very readily by breaking down the nasal wall of the antrum in the middle meatus and sometimes the route through the inferior meatus is the one of choice.—Ed.]

Accidentally Removed Nasal Mucous Membrane Adheres and Functions When Replaced. The following case is reported by E. V. Hubbard[4].

The patient was a male, clerk, thirty years of age, with a negative history, except for obstructed nasal breathing. On examination, a large spur on the septum was found, lying low on the right side. In view of

(4) Med. Jour. and Rec., Feb. 18, 1925.

a moderate resulting catarrh and slight tinnitus in both ears, the removal of the spur was recommended—apparently a simple operation under novocain anesthesia. The mucous membrane was found adherent to the underlying cartilage and bone comprising the septum.

When the separation of the mucous membrane had been completed and the cartilage was removed, by accident the entire quadrangle of mucous membrane was torn away and removed also. This square piece, rather more than a centimetre on each edge, was undamaged except for a point where it was torn loose posteriorly. It was immediately placed in warm saline solution. The removal of the hard parts having been completed, an attempt was made to replace the curtain of mucous membrane unfortunately removed. Being lightly dried with gauze, the piece was set as nearly as possible in its original position. A Bernays sponge was introduced, followed by a second one. This plug was immediately moistened with saline solution, and, as it expanded, held the loose piece of mucous membrane in position. The next day when the sponges were gently removed, the replaced mucous membrane adhered to its original position, its inner surface apparently fast to the inner surface of the mucous membrane unhurt on the opposite side. There was no hemorrhage.

The patient was seen daily for a week, the membrane remaining in place and having a good color. At the end of a month, the membrane continued to look normal and appeared to be functioning.

Nasal Disease and Neurasthenia. From year to year as new etiologies are discovered by scientific medicine the group of conditions described under the generic name of neurasthenia becomes smaller and smaller. According to J. A. Glassburg,* neurasthenia is not a disease *per se* but a symptom-complex, the causation of which is not known.

(*) Amer. Med., July, 1925.

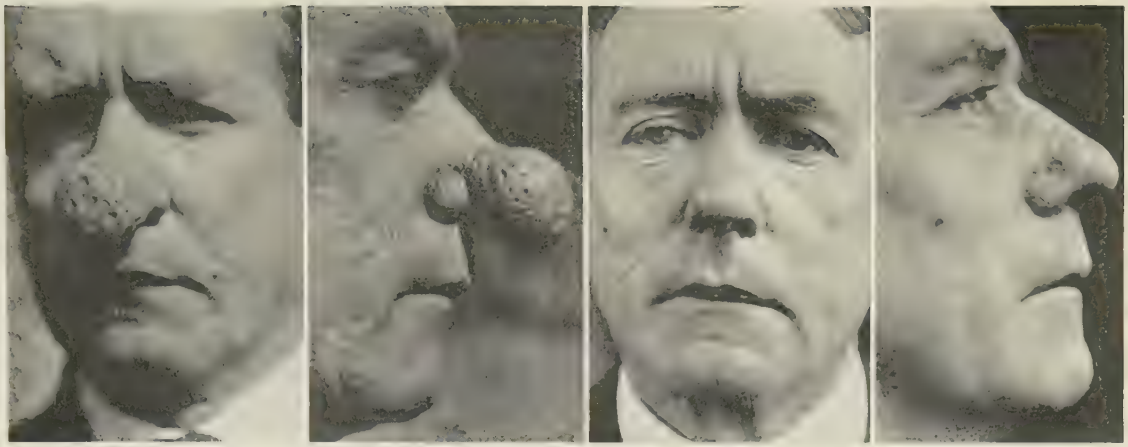
The author's report consists of a series of thirty cases, all of which showed neurasthenia, headache and nasal pathology. In each case there was either improvement or complete relief after operation had been performed. Arranged according to diseases, there were eight cases of hypertrophic middle turbinates, four cases of pansinusitis, four cases of ethmoidal sinusitis, three cases of deviated septum, three cases of polypi, two cases of frontal sinusitis, one case of hypertrophic inferior turbinates and five cases of combined hypertrophic rhinitis and sinusitis, either of the frontal or ethmoidal sinus, but mainly of the former.

Five of the 30 cases are reported in detail, showing the successful results obtained.

[This paper is a vivid demonstration of the necessity of proper training in making a satisfactory nasal examination and evaluating the findings. It is rather a dangerous field for a novice to enter upon the treatment of neurasthenia by intranasal operating, especially where one claims satisfactory results from the correction of such things as an irregular septum or variations in the size of the middle turbinal passing under the name of hypertrophies. It is important to remember, too, when one is dealing with neurasthenias, that favorable results can be expected in a large percentage of cases following any form of treatment which impresses the patient mentally. This is quite irrespective of any possible relationship between the condition for which the operation was done and the causation of the neurasthenia.—Ed.]

Rhinophyma. Six cases of rhinophyma treated by radical surgical measures are reported by J. M. Grattan.* In the operation, after first cleansing the face, the author injects 4 per cent. novocain around the nose, beginning at the columella and extending laterally across the base of each nostril, along the outer border of either ala and upward from these points and

(*) Surg. Gynec. and Obst., July, 1925.



Front and profile photographs showing before and after operative treatment of a case of rhinophyma. —Grattan, page 398

across the middle of the nasal bones. In addition the supra-orbital nerves and the middle branches of the trifacial nerves are blocked off at their emergence. The skin is infiltrated along the lines of excision of the separate masses of tumor tissue.

In the author's technic, curved incisions are made slightly above the line where each tumor mass shows above the estimated level of what is intended to be the final level of the reconstructed nose. Sufficient skin from around the base of each tumor is saved so that these edges may be approximated and sutured, thus covering the raw areas left by excision of the tumor tissue. After excision of the masses and suture of the skin edges 1 per cent. iodin in glycerin is painted over the suture line and aristol powder is then dusted over the nose. A vaselined gauze dressing is applied, held in place by adhesive straps.

The average stay in the hospital is three to four days. Complete healing occurs by the tenth day; the sutures being removed within this period as indicated, by loosening.

The author emphasizes the postoperative treatments, which are very essential to complete success in these cases. As a rule, after two *x*-ray treatments of one-half unit at weekly intervals, including one-fourth unit each time to the entire face to clear up the remains of the general acne, 50 per cent. trichloracetic acid is applied to the elevated areas at the end of the third week. Scabbing from this application requires six to seven days for completion, and a pink area remains four to five days longer. Subsequent *x*-ray and acid applications are given as necessary. The entire time required for the elimination of the irregularities and scars of the operation varies from three to five months (Plate XX).

Intranasal Surgery; with Relation to the Turbinates. In this article E. H. Jones* discusses only the intra-

(*) New Orleans Med. and Surg. Jour., September, 1925.

nasal surgical procedures that involve the turbinates, exclusive of the treatment of neoplasms.

In regard to the inferior turbinate, surgery is not often necessary. Occasionally there is a hyperplasia of the soft tissues and this may be removed with a snare or biting forceps. Bony hyperplasia is best handled by the submucous resection of the bony tissue of the turbinate. The middle turbinate may present a variety of conditions, such as a lobulus, a turbinal cell, hyperplasia of the mucous membrane or bone, or both. Submucous resection of the lobulus usually suffices, although in some cases the lobulus may have to be removed. Hyperplastic conditions are seldom relieved except by surgery. A turbinal cell of any size should be removed because it obstructs both the air passages and the ventilation of the sinuses. Amputation of the tip of the turbinate (with a snare) will usually open the cell and the lateral wall may then be removed with a curette or biting forceps.

The correct way to relieve polyp formation is to relieve the cause—sinus infection—after removal of the polypi. Hyperplasia of the anterior end of the middle turbinate may be treated with astringents in the mild cases, but otherwise removal of the enlarged portion gives the best results. In radical sinus operations the turbinates may either have to be fractured out of the way or portions removed.

The author strongly advises leaving the turbinates alone unless definite indication for surgery is present, and then if it is, to take care of the situation as conservatively as is compatible with a successful result.

[The statement that the proper treatment of nasal polypi is the cure of sinus disease assumes that sinus disease is the cause of polypi, a proposition which had rather a strong following in earlier years. Nasal polypi are the outcome of a hyperplastic non-secretory ethmoiditis. Where sinus disease, that is, in suppurative diseases of the sinuses is found associated with polypi

as occasionally occurs, it is always a secondary affair and its persistence is somewhat dependent upon the interference with drainage caused by polypi.—Ed.]

Physical Allergy. W. W. Duke[5] discusses sensitiveness to light, heat, cold and mechanical irritation, and also the various reactions of the body to these irritants. From his experience the author comes to the following conclusions:

1. The symptoms bronchial asthma, vasomotor rhinitis and conjunctivitis, photophobia, abdominal pain, erythema, pruritus, urticaria, angioneurotic edema, eczema and shock can be caused in some patients specifically and solely by the action of a physical agent, such as light, heat, cold, mechanical irritation, freezing and burns, and, in the case of heat sensitiveness, indirectly by mental and physical exertion.

2. As a rule, symptoms are caused specifically by one physical agent only, although occasionally by two or more.

3. Patients sensitive to material substances, such as pollen, animal hair and food, rarely react specifically to the action of physical agents, and *vice versa.*

4. The condition seems the commonest single cause of the symptoms mentioned in the group of cases which give negative skin tests to pollen, animal hair and other material substances.

5. Heat and cold are the more common causes of reaction and, of these, heat is a more common cause than cold.

6. For this type of disease, the name "physical allergy" (allergy caused by physical agencies) is used. It is not assumed, however, that physical allergy is identically the same disease as allergy caused by material substances, such as pollen and animal hair, although it is believed that they are closely related.

7. Four important types of reaction were observed: first, local or contact reactions, confined to the area

(5) Jour. Amer. Med. Ass'n., Mar. 7, 1925.

directly exposed to the physical agent; second, shock reactions when large areas of skin were exposed in contact cases; third, reflex-like reactions which might involve the areas directly exposed and distant structures as well, and fourth, solitary reactions.

8. Several possible explanations for the condition might be offered. One which seems likely is based on an assumption that patients with allergic tendencies might become specifically hypersensitive to some new body formed in the tissues solely under the influence of one physical agent. Another explanation worthy of consideration is based on an assumption that under certain abnormal conditions a protein molecule might be broken down under the influence of a physical agent, with the liberation of a histamin-like body, and that this causes the reaction.

9. Testing with the physical agents mentioned and treatment carried out along logical lines with physical agents are useful in the specific diagnosis and specific treatment of the allergic symptoms mentioned.

[It is with a great deal of satisfaction that the rhinologist finds the internist coming in to assist in solving the problems of allergy, the most conspicuous symptoms of which are the nasal symptoms the relief of which have baffled rhinologists who have relied upon local measures, and almost every type of local measure has been undertaken for the relief of these symptoms. The rhinologist has in the past been encouraged in resorting to intranasal work because relief is obtained in some cases where this chain of symptoms is associated with the development of hyperplastic ethmoiditis. In these cases the exenteration of the ethmoid may result in a most dramatic relief of the symptoms, even of the asthma. Unfortunately, it is the exception rather than the rule that local conditions in the nose are found the correction of which relieves the symptoms of allergy.—Ed.]

Relation of Intranasal Disease in the Production of Bronchial Asthma. M. J. Gottlieb* classifies asthmatic cases as follows:

1. Asthma with unmistakable allergic findings, complicated by chronic purulent or hyperplastic sinusitis.

2. Asthma with slight or no allergic finds associated with chronic purulent or hyperplastic sinusitis.

(*a*) Cases of asthma due to the absorption of protein radicals from an area of disease in the paranasal sinuses.

(*b*) Cases of asthma of purely reflex origin, the nasal ganglion being irritated or rendered diseased from an adjacent sinus infection, or stimulated by impulses which come from correlated nerve fibers.

(*c*) Cases of asthma of combined absorption and reflex character.

The author believes that cases which show definite protein sensitization and also nasal pathology may be relieved by treatment or measures directed to one or both of these causes. However, he does not believe that the presence of a slight degree of sensitiveness is, in itself, a sufficient cause to provoke typical asthmatic attacks. In these cases there is usually some acute or chronic nasal pathology also present which excites the attack. In cases where there is evidence of nasal disease the author advises eradicating this as thoroughly as possible. If necessary, radium emanation is used in the nose following the surgical measures, and also, nasal ganglion injection, when indicated. To prevent recurrence of the attacks, when the above fails to produce permanent relief, the author injects one million mixed typhoid bacilli intravenously. This is repeated at two week intervals if the attacks persist.

In the cases of asthma in children the symptoms are in some cases due to absorption from a nasal focus, in some, purely reflex, while in others both factors are probably causative. The author reports 117 cases of

(*) Jour. Amer. Med. Ass'n., July 11, 1925.

asthma in which 31 patients showed disease in the paranasal sinuses. Several illustrative cases are given in detail.

[The frequency with which intranasal or sinus pathology is associated with asthmatic symptoms has long been recognized. Where palpable evidences of this pathology exist, operative treatment is warranted. The results, however, are more often disappointing than encouraging. The most tangible results are likely to follow upon the correction of the hyperplastic form of ethmoiditis which is accomplished by exenteration of the ethmoid. The established facts regarding the relationship between real nasal and sinus disease and asthma has led many rhinologists in the past to assume that the other anatomical variations, especially spurs and ridges of the septum, may also be related to asthmatic trouble and has thus occasioned a large part of unnecessary tinkering nasal operations on these parts.—Ed.]

Bronchial Asthma and Allied Allergic Disorders. Because of the importance of the inhaled substances in general and house dust in particular, S. S. Leopold and C. S. Leopold[6] deemed it appropriate to attempt to devise a method whereby these patients could be studied under controlled conditions of environment. These conditions should incorporate records of room temperature and relative humidity.

Accordingly the authors developed a special treatment room. In this room infiltration of outside air was guarded against, and only controlled washed air allowed to flow in and out. In this way, at least the large dust particles could be removed, and the smaller particles to a lesser extent. The apparatus would seem applicable to the following groups of cases:

1. Cases of dust-asthma with nocturnal attacks, which are unrelieved despite most painstaking investigation and alteration of house and bedroom environment.

(6) Jour. Amer. Med. Ass'n., Mar. 7, 1925.

2. Cases reacting to house dust when attempts at specific desensitization with the particular dust has brought no relief. It is reasonable to suppose that desensitization with an unknown substance, dosage being of necessity arbitrary, would be of doubtful value.

3. Patients having hay-fever or hay asthma, in whom specific desensitization cannot be used or has been tried with complete failure.

The authors report two illustrative cases and conclude that:

1. The experiments, here recorded, seem to indicate that it is possible by means of proper equipment to render a room relatively dust free, efficient to the point of keeping a patient with dust asthma free of asthmatic seizures.

2. It seems evident that house dust contains one or more specifically allergic substances capable of producing an immediate constitutional reaction, and that this reaction cannot be explained on the basis of mechanical irritation.

3. Changes of barometric pressure and wet and dry bulb temperature have had no demonstrable effect on the clinical symptoms of those patients so far observed.

4. This report is to be regarded as preliminary, in order to record the type of room which has been used and its equipment. Further studies are in progress and will be the subject of further communication.

[It would seem from a perusal of this report that the authors are carrying out an experiment that hardly has in its making evidences of a form of treatment that can be practical. If a person suffering from allergy from house dust has to live cooped up in a room kept free from such particles by having the air washed, or shall we say subject this subject to this treatment because of the pollen laden air, would it not be much more to the patient's liking and well-being to migrate to some place where such dust particles and pollens are absent. Such

places are readily found in the northern woods or in the mountains of the West.—Ed.]

Diseases of the Mouth

Dermoid Cysts of the Floor of the Mouth. According to R. Colp[7] dermoid cysts involving the floor of the mouth are rare. There is no doubt that the majority of these tumors must be congenital, and this is not altered by the fact that many do not develop until later in life. The great majority of cases occur between the ages of 12 and 25. The cysts are divided into median and lateral varieties. The former are by far the more common, the latter rare and unusual. The median type is divided into the geniohyoid cysts, those resting upon the mylohyoid muscles and spreading the fibers of the geniohyoid muscles apart, and the genioglossal cysts, resting upon the geniohyoid muscles, pushing the genioglossi apart. The lateral tumors occupy the region above the mylohyoid, beneath the mucous membrane of the mouth, between the latero-inferior aspect of the tongue and the ramus of the lower jaw.

The genioglossal group of cysts are felt as small lumps under the tongue in the region of the frenum. As they enlarge the tongue is pushed upward, causing the mouth to be kept open. Finally, difficulty in mastication and deglutition, and dyspnea may occur. The geniohyoid type of cyst appears as a swelling in the submental region. On enlarging it gives the appearance of a double chin (Fig. 55). Pain is unusual in all the types, unless the lingual nerve is pressed upon. Perforation may occur through the floor of the mouth, the tongue, or even the neck. The fistulae thus formed may persist or may heal with the subsequent refilling of the cyst.

(7) Surg. Gyne., and Obst., February, 1925.

On physical examination, the tumor is soft, cystic, or elastic, and round, oval, dumbell or kidney shaped. Its capacity varies from a few cubic centimeters to one which may contain 1200 c.c. of fluid. The overlying skin is normal in color and texture and freely mobile. Fluctuation is present unless the mass is very tense. In the mouth the raised mucous membrane is normal, as also are the openings of the salivary glands.

Fig. 55.—Photograph of case, showing the deformity typical of dermoid cyst of the submental or geniohyoid variety.

Exploratory puncture will usually make the diagnosis, for aspiration of the characteristic sebacious contents point either to a dermoid or lingual cyst. From the latter the dermoid can only be differentiated by a pathological examination of the cyst wall. The tumors must also be differentiated from angiomas, lipomas and ranulae.

In the treatment of these cysts, the author emphasizes that total excision is the only procedure by which recurrence can be prevented. The method of approach varies with the individual case. Some cysts are best removed through the mouth, or buccal route, others through the neck—the suprahyoid route. The size and anatomical location of the cyst should be the deciding and determining factor. Cases complicated by fistula are more difficult. The author has not found probing the delicate fistulous tract or methylene blue or bismuth injection of any practical value. The best guide is a history as to where the tumor made its first appearance. The author reports three cases and also presents abstracts of case reports.

Actinomycosis of the Tongue. The tongue is a very rare site of actinomycosis, because it is composed of little cellular tissue on which the ray-fungus grows best, and is protected by a thick epithelial cover.

According to R. A. Barlow[8] the patient usually presents himself because of a swelling or localized nodule in the tongue. As a rule the condition is of four or five months standing, and the symptoms are not marked or severe. The symptoms of soreness and slight immobility are most noticeable at first, and these increase as the tumor or nodule becomes more prominent. It is from this feeling of stiffness that the name "wooden-tongue" has been derived. Although a few patients complain of intense pain, it is a very rare accompaniment of the condition even on mastication. There is no fever or general impairment of health, and the course of the disease is essentially chronic.

The actinomycotic nodule is usually located well in the anterior portion of the tongue, and the patient can generally recall some injury, either produced by a foreign body or irritation of a ragged tooth. The nodule is indurated and tender, and the mucous membrane is tense over the area much as though it were stretched

(8) Laryngoscope, April, 1925.

over a foreign body. Lymphatic enlargement is not characteristic. There is marked irritation in the tissues associated with proliferation of fixed cells. The mass increases in size at the expense of the muscles, which atrophy, and there is a decided increase in rose color of the fibers in proximity to the nodule. The vessels also show evidence of granular degeneration with thickening, and the fibers of muscle tissue in the neighborhood lose their striations.

The abscess itself is cellular and contains some white globules. Centrally may be seen the yellow or so-called sulphur bodies. Occasionally, the nodule will rupture spontaneously and evacuate a foul-smelling, bloody fluid in which may be seen the sulphur bodies.

The salient points in diagnosis are a history of chewing grain beards or grasses, or caring for animals with the disease, a chronic course and lack of general lymphatic involvement. Incision of the nodule and recognition of the sulphur bodies and ray-fungus under the microscope verify the diagnosis.

The treatment which yields best results is a combination of a local surgical measures, that is, incision and drainage, administration of potassium iodid internally, and application of copper sulphate to the incision. In addition, the application of radium to the nodule hastens softening and resolution, and facilitates the elaboration of the potassium iodid. The wound may also be swabbed with silver nitrate solution or the actual lunar caustic bead.

The results of treatment are satisfactory when the disease is recognized before multiple abscesses have developed and when the nodule is not too deeply seated near the base of the tongue. The patient should report for observation at intervals, because there may be a tendency for recurrence, unless all the pockets in the nodule are clean.

The author concludes with the report of a case of the condition described.

Tuberculosis of the Tongue. The tubercle bacillus may gain entrance to the tongue by: (1) direct inoculation from outside the body; (2) inoculation from sputum, as in pulmonary tuberculosis; (3) inoculation from the blood or lymph stream, as in miliary tuberculosis, and (4) spreading from adjacent tissues, as in lupus vulgaris of the face or mouth. H. Morrow and H. Miller[9] report sixteen cases of which one belonged to the first group, thirteen to the second group, one to the third group and one to the fourth.

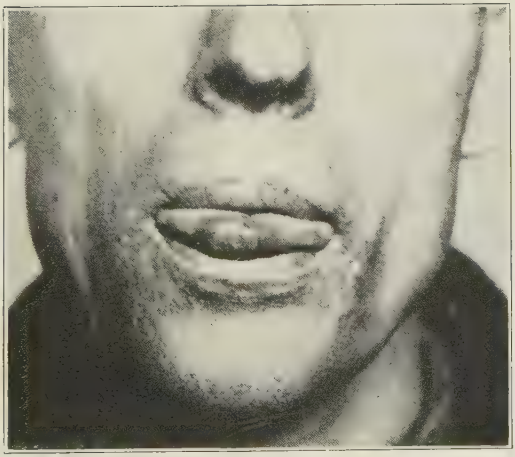
Clinically, cases of tuberculosis of the tongue fall into one of the following groups:

1. Nodular.
   - (*a*) Superficial.
   - (*b*) Deep.
2. Ulcerative.
   - (*a*) Superficial.
   - (*b*) Deep.
   - (*c*) Fissured.
3. Papillomatous or warty.

Small, scattered and superficial nodules may occur in miliary tuberculosis. A solitary and superficial nodule may be seen in primary tuberculosis of the tongue, while the multiple and deep lesions occur only in secondary tuberculosis. The deep-seated nodules are scattered throughout the tongue, and are covered by unbroken mucous membrane. Lesions of this type may go on to caseation without ulceration.

Most of the ulcers begin as superficial nodules, but the patient's attention is not called to it until it breaks down and becomes slightly painful. The ulcer is by far the most common of all of the tuberculous lesions on the tongue. In all but two of the authors' sixteen cases, the lesions were of this type. The ulcer may be small or it may cover one half or more of the surface of the tongue. The lesion is generally superficial, covered with a yellowish gray mucus, and surrounded by a reddish areola. Plate XXI illustrates this most typical type. A more or less harmless looking fissure may

(9) Jour. Amer. Med. Ass'n., Nov. 8, 1924.



Superficial tuberculous ulcer on the tip of the tongue, in a patient with advanced pulmonary tuberculosis.—Morrow and Miller, page 410.

A

B

A—Modified from Brophy's book. Incision to release the hard palate.

B—Note increased length of palate below dotted line.—Dorrance, page 414.

occur on the edge or dorsum of the tongue, which, when it is spread apart, may be found to be deep, extensive and branching.

The papillomatous or warty tuberculous lesion of the tongue is one of the rarest types. It resembles the papillomatous type of carcinoma.

The symptoms of which the patient complains vary with the type of lesion represented. As in the case of tuberculosis located elsewhere in the body, there are generally no symptoms until ulceration and secondary infection occur. The early symptoms are slight pain and burning in the ulcerated area. Late in the course of the disease, pain, salivation and limited motility of the tongue may be so marked that eating and speaking are interfered with. There is a moderate regional adenopathy in the cases with ulceration, a condition that is undoubtedly brought about by secondary infection.

The tuberculous lesion may occur anywhere on the tongue. In general, the lesions occur more often on the superior surface of the tongue than on the inferior, and the tip and lateral borders are more frequently involved than the posterior part.

The differential diagnosis of a tuberculous lesion of the tongue, in the absence of outspoken pulmonary involvement and microscopic examination of tissue, is a matter of considerable difficulty and importance. The mutilating surgical removal of an erroneously diagnosed carcinoma of the tongue, or the possible harmful effect of strenuous antisyphilitic therapy on a tuberculous patient, need only be mentioned as the possible results of a mistake in diagnosis.

Tuberculosis of the tongue must be differentiated from a primary sore, a gumma, an epithelioma, the traumatic and infectious ulcers, leprosy and the benign tumors.

A primary sore is usually more indurated, and the infiltration extends beyond the border of the ulcer. It

is of limited duration. Dark field examination will reveal the presence of *Spirochaeta pallida*. In three of the patients, the authors were able to rule out this possibility only after repeated examinations.

A gumma generally occurs on the posterior part of the tongue, while a tuberculous lesion is more often on the anterior half or lateral borders. An ulcerating gumma is usually deeper than a tuberculous ulcer, and the walls of the lesion are more sharp. The complement fixation is positive in about 80 per cent. of the cases, and a therapeutic test is generally conclusive.

A carcinoma is usually more indurated, is almost always solitary, and often can be diagnosed only by a pathologic examination. It tends to occur at the same age, at about the same location and in the same sex as does tuberculosis of the tongue. Early diagnosis of carcinoma of the tongue gives the patient his only chance of a cure.

In the traumatic ulcers, there is generally some obvious source of trauma, and the ulcer heals rather promptly when this is removed. The infectious ulcers as seen in cases of aphthous stomatitis, Vincent's angina, and so forth, are seldom limited to the tongue, and they generally respond readily to local therapy.

Leprous nodules on the tongue are rare, and seldom if ever, exist without other signs of the disease.

The benign tumors, such as angiomas, are not often difficult to rule out, because of their duration, lack of symptoms, and the fact that they occur at an early age.

After all of the clinical and laboratory procedures have been carried out, a large percentage of cases remain to be diagnosed by a pathologic examination. The pathologic picture of tuberculosis of the tongue is essentially that of tuberculosis elsewhere in the human body. There is a tubercle formation, with round cell infiltration, with some perivascular arrangement and the presence of the characteristic giant cells. It is often impossible to differentiate tuberculosis from

syphilis pathologically without resource to animal inoculation or to special staining for the tubercle bacillus.

If a piece of tissue is to be removed for pathologic examination, the entire lesion or none at all should be removed. A tuberculous lesion that has been cut into breaks down rapidly, becoming more extensive and more painful.

In primary tuberculosis of the tongue, the prognosis is good when the entire lesion is removed surgically. When the lingual lesion is secondary to a pulmonary process, it generally comes late in the course of the disease. Practically all of these cases end fatally. However, the surgical removal of a discrete tuberculous ulcer will prolong the life of the patient, and allow him to spend his remaining days in comfort.

In the localized primary lesions as well as in the localized secondary lesions, the surgical removal of a V-shaped area gives the best results. In the extensive ulcerative cases, cautery may be of some value. Curetting the lesion generally makes it more extensive. Lactic acid, phenol, and alcohol, applied locally are of little value. The authors have used the Kromayer light, roentgen ray and radium, all without success. Aside from surgical removal, rest, forced feeding and tuberculin therapy, offer the only hope for cure.

Diathermy for Cancer of the Tongue and Pharynx. N. Patterson[1] has found the results of diathermocoagulation vastly superior to those of surgery. Especially in the early stages, before the glands are involved, the prognosis is excellent. In any case, however, the cervical glands should be removed surgically, preferably after the diathermopenetration. Ligation of the arteries supplying the tumor will forestall hemorrhage following elimination of the eschars. An exploratory excision for the purpose of establishing the diagnosis of epithelioma has its advantages; but it must be borne

(1) Arch. d'électric méd., September, 1924.

in mind that tumor is frequently stimulated thereby to accelerated growth.

The author reports 18 cases (cancer of the tongue, the palate, the posterior wall of the pharynx, the tonsils, the anterior pillars, and the floor of the mouth), in all of which a cure was effected with no recurrences during a period of observation ranging from one and one-half to eight years. Some of these cases had been rejected by surgeons as inoperable. One patient, who had been successfully treated for a small tumor of the uvula, refused surgical extirpation of the cervical glands. Four years later the cancer developed in these glands, whereas there was no recurrence in the uvula or in the palatine region.

Lengthening the Soft Palate in Cleft Palate Operations. The reason for failure in certain cleft palate operations where the cleft is successfully closed lies in the fact that the soft palate is unable to come in contact with the posterior pharyngeal wall. G. M. Dorrance* proposes an operation in which he first obtains a sufficient length of palate to insure good phonation and then later closes the hard palate. The operation is best performed from the fourth year of life on as before this age there is not sufficient fat and lymphoid tissue in the hard and soft palate. The increase in length of the palate is obtained by releasing the anterior attachment of both the hard and soft palate.

To release the structures of the hard palate, the author makes an incision as shown in Plate XXII, A, at the same time freshening the edges of the cleft. Flaps are then raised containing all the structures down to and including the periosteum over the hard palate. The elevation of the flap is continued until the border of the hard palate is reached, the attachment of the palatine aponeurosis of the hard palate being divided. On reaching the tuberosity of the maxillary bone it is found that there is still some structure which prevents

(*) Ann. Surg., August, 1925.

the palate from falling backwards. This structure is the tendon of the tensor palati muscle. When the hamular process around which this muscle turns at a right angle is broken off the divided portions are drawn downward by the pterygo-pharyngeus muscle. After the hamular process has been fractured the tendon of the tensor palati muscle is dislocated, thus changing its direction so that instead of forming two sides of a right angle triangle it forms the hypothenuse. This allows the lengthening of the muscle and transposes it from a tensor into a levator muscle. After the above procedure has been performed on both sides, there will have been gained one-half to three-quarters of an inch lengthening and there will be found to be less tension than under the Langenbeck operation. The two flaps are now sutured together, as shown in Plate XXII, *B*, using whatever suture that is desired. The anterior edge of the flaps have a tendency to fall downward and to hold them in place, they are sutured to either the remains of the septum or the horizontal plate of the palate bone. While this operation gives the desired lengthening as shown in *B*, it leaves a defect in the anterior portion of the hard palate. This is later closed by means of a flap.

Diseases of the Throat

The Tonsils

Some Phases of the Tonsil Question. In this article H. D. Newkirk[2] discusses the diagnosis, prognosis, and treatment of infected tonsils. From the replies received in answer to several questionnaires, sent to a number of laryngologists and internists, and from his own observations, the author comes to the following conclusions:

1. In the matter of diagnosis, the important points

(2) Laryngoscope, May, 1925.

are: (a), the history of the case; (b), the character of the cervical glands; (c), the evidence found by direct examination; (d), the condition of the pillars; (e), a history of diseases caused by focal infection.

2. In regard to prognosis. With our present knowledge we have no alternative other than advising removal if infection is found, simply hoping that the symptoms of a focal infection will be improved. We have no way of being certain that focal infection diseases, supposed to be caused by infected tonsils, will be prevented or that definite diseases of this character which the patient now has will be cured, other than the fact that general statistics support the point. Whether a particular individual will be benefitted we cannot say and until studies have been made determining selective foci and individual resistance, and this resistance balanced against his known infection, we will not be able to speak authoritatively to him on this point.

3. In regard to treatment, the writer believes the anesthestist a major factor in tonsil operations. The Rose position, favoring gravity, is the proper position for a general anesthetic in tonsil operations, since it is almost impossible while in this position, for the patient to insufflate blood clots, adenoid material, stomach contents or what not. Also, in doing a tonsillectomy in an adult under a local anesthetic, the author advises against painting the throat previously with a cocain solution, since if sensation is lost in the pharynx it is much easier for materials to drop unnoticed into the trachea and thereby be a factor in the production of a lung abscess.

[A rigid adherence to the suggestions in this paper seems to leave the gate open for the removal of all tonsils, especially in adults. The chief stumbling block seems to be in determining what evidences of chronic tonsillitis warrant the advice that the tonsils are a menace and should be removed. Absolutely normal tonsils are rarely found in adults, especially where we

accept the presence of cheesy concretions and the more or less conspicuous area of congestion over the anterior pillars as evidences of pathological conditions, which they certainly are. The finding of actual pus in the tonsils is of course a very unusual finding. When present it constitutes a definite indication for the removal of the tonsils, but the finding of cheesy concretions and the presence of a more or less definite area of congestion over the anterior pillars is so commonly found in adults that if this is an indication for the removal of tonsils few people would escape having their tonsils out. Where the local indications for tonsil removal are so indefinite and are limited to the findings just referred to we are inclined to leave such tonsils alone unless there is a definite history of recurring tonsillitis or unless the internist, in spite of our negative findings, feels that there is a systemic infection of sufficient menace to warrant the advice to have such tonsils removed. It is only by working in this way in cooperation with the internist that the otolaryngologist will be able to avoid the risk of doing a lot of unnecessary work.—Ed.]

Microscopic Study of the Excised Tonsil in Relation to Tonsillectomy. For this study 172 tonsils were utilized. The pairs of tonsils were removed by all the various methods by laryngologists of recognized skill in different parts of the country. S. Israel[3] states that the tonsils fell into the two general classifications, *viz.*, large, or hypertrophied, and small, or atrophic.

Immediately after removal the tonsils were placed in 4 per cent. formalin solution and sent to the author. Paraffin sections of each tonsil were studied. In all, 500 sections were prepared; on an average, three sections being cut from each tonsil.

From his study the author concludes that:

1. Comparatively few tonsils are removed without some muscle tissue attached.

2. The largest quantity of muscle tissue appeared in

(3) Ann. Otol., Rhinol., and Laryngol., March, 1925.

sections of the smaller, or atrophic type of tonsils in adults. In these cases the muscle was found attached mainly to the lateral surface.

3. In the case of the larger tonsils, especially in children, the muscle tissue consisted chiefly of part of the palatoglossus and the mucous membrane of the anterior pillar.

4. A so-called true capsule of the tonsil, which can be separated as a definite independent structure, does not exist.

5. The amount of bleeding and type of bleeding are dependent chiefly on the anatomic development and distribution of the blood supply in the individual case and not upon the instrument used for tonsillectomy.

6. The amount of postoperative discomfort and deformity in end-results are influenced by the amount of adjacent muscle tissue removed at the time of operation.

7. Small fragmentary fibers of muscle tissue are impossible to avoid at the time of operation and are of no clinical consequence or importance.

8. The dissection operation properly performed and under direct view, step by step, as the tonsil is enucleated, yields the greater number of complete removals.

Study of Streptococcus Hemolyticus in Tonsillar Crypts. C. C. Eves and W. R. Watson[4] examined the cultures taken from the throats of over 450 children attending certain private schools in Philadelphia. The authors state that their results give nothing new to offer except substantiation of a fact that has already been amply proven: that the home of the streptococcus hemolyticus is in the crypt of the tonsil; that it has a benign influence on the tonsil itself; that, theoretically, it may, in certain specialized physical conditions, be the etiological factor in some of the infectious diseases; and lastly, that it has been pretty well proven to be

(4) Laryngoscope, March, 1925.

associated in many of the complications of all infectious diseases.

In none of these series did the authors find any microscopic evidence which would enable them to determine the presence or absence of any one class of organism. Deeply congested bands along the margins of the anterior pillar and pharyngeal wall, as well as congested tonsillar tissue, may be found from infection of any of the more virulent organisms. Neither has it been possible to determine the character of the infecting organism by the amount, consistency, or color of the secretion expressed from the crypts. Until more definite evidences are produced by the laboratory one must determine the advisability of removing diseased tonsils upon the history of the patient, the appearance of the tonsil and surrounding tissue, the amount and character of the secretions expressed from the tonsil, and the condition of the cervical glands. In doubtful cases a culture taken from the deep crypts showing a predominance of any form of streptococcus, pneumococcus, and so forth, should influence one to advise removal.

[We are quite in accord with the general conclusions reached by the authors. The examination of bacteria from the surface of crypts of the tonsils has not been of any particular assistance in reaching the conclusion as to whether the tonsils should or should not be removed. Bacteria like hemolytic streptococcus capable of producing pathology, are found as a rule in tonsils for which there is no clinical evidence that they are a menace.—Ed.]

The Waring Suction Tonsillectomy—Is it Worth While? F. W. Bailey[5] discusses the results obtained by him in using this procedure in a series of 35 cases, all patients being under a general anesthetic. The author states that with the glass bowl in place he could not tell for sure just where the uvula and posterior pillar were.

(5) Laryngoscope, February, 1925.

The application of the glass tube sucks the contents of the tonsillar crypts into the bowl, thus prohibiting clear visibility. As soon as the snare is tightened and the tonsil disengaged from the bowl, the tonsillar debris falls into the throat and the tonsil itself must be grasped to prevent aspiration.

As a rule the tonsil comes out with considerable muscle tissue. The writer believes that the center of the tonsil is sucked up into the tube farther than the edges, thus carrying with it the muscle tissue to such an extent that the snare loop does not follow the tonsil capsule. In some cases the technic was abandoned because the pillars could not be kept out of the bowl. It is often difficult to engage the second tonsil in the bowl because of mucous in the throat making the glass too slippery. The tonsillar fossa bleeds just about as freely as if the operation were performed by the Sluder technic.

In concluding the author states that he does not want to detract any credit from Waring—perhaps there is a trick about the technic which the writer has not mastered. However, at the present time the method has not proved to be as satisfactory and simple as was reported by its originator.

Pathologic Basis for Roentgen Ray Treatment of Tonsil Disease. After discussing the anatomy and function of the tonsil W. W. Watkins[6] states that the irradiation of the tonsil can be so graduated by the intelligent radiologist as to effect a partial destruction or dispersion of the abnormal mass of lymphoid cells, or complete destruction, with fibrous tissue formation. The cervical lymph glands and the lymphatic tissue of the pharynx are also affected, and this is usually desirable. The arguments about injury to the thyroid or the pituitary, or permanent injury to the skin are as foolish as would be the argument that surgical removal of the tonsils should never be undertaken because lung

(6) Jour. Amer. Med. Ass'n., Sept. 25, 1924.

abscess sometimes results, or the pharyngeal pillars are injured.

The one thing established by all the investigations on the tonsil, is that the bacteriologic findings and the clinical condition of the tonsil have no definite relation, and the results of treatment by radiation or by surgical methods are not to be judged by bacteriologic findings. One can take cultures that will yield *Streptococcus hemolyticus* from all tonsils, if one keeps trying. Their presence in the crypts, so far from meaning, *per se*, that the tonsil is dangerous and requires radical treatment, indicates that the tonsil is performing its function and holding back these organisms, else they would be inside the tonsil and beyond the reach of the aspirator. Cultures furnish only confirmatory evidence of clinical symptoms.

There may be, in the tonsil: (1) hypertrophy, (2) acute infection, (3) chronic infection, and (4) malignancy.

Malignancy is not considered since there is no argument over the indications for irradiation in that condition.

Hypertrophy of the tonsil, or a simple increase in bulk, if it calls for any treatment because of mechanical factors, is better irradiated than subjected to tonsillectomy; irradiation can be so graduated as to bring about a reduction to normal size. The very presence of hypertrophy, without actual infection, indicates some degree of status lymphaticus, of which the wise surgeon fights shy.

Acute tonsillitis may be either follicular or interstitial. In the pure follicular type, the infection is confined to the crypts and mucous membrane, without invasion of the stroma, and, therefore, without swelling of the tonsil. In the pure interstitial type, there is invasion of the lymphatic stroma and massing of the lymphoid cells within the tonsil, with consequent swelling of the organ. As a matter of fact, the infec-

tion of purely one type or the other is not seen, and we have both infected crypts and a swollen tonsil. The acute tonsillitis either promptly subsides or passes into the chronic stage.

In the chronic tonsillitis, pure types may be encountered. The chronic follicular tonsillitis, with infection of the crypts, is accompanied by infiltration of the epithelium by round cells, multiplication of the epithelial layers and exudation into the crypts or on the surface of the tonsil. The crypts may gradually fill up with débris, or may become constricted by swelling of the mucous membrane lining them, or by formation of cheesy plugs.

Chronic interstitial tonsillitis may be an infection of the stroma, producing reaction in the lymphoid elements, and swelling of the tonsil: this is the hyperplastic type. On the other hand, when the infection is gradual, and fibrosis can keep pace with the inflammatory destruction of the tonsillar stroma, we have the fibrous type. In the hyperplastic type, the increase in mass crowds on the germinal nodules, narrows or obliterates the crypts, and hampers drainage of toxic products from the interior of the tonsil. Destruction and lack of drainage may cause abscess formation within the tonsil or around it.

[The correct evaluation of the benefits from irradiation of the tonsils cannot be reached until a much wider experience has been obtained. Some rhinologists have been unwisely enthusiastic about the results. The one thing that can be expected from irradiation is the shrinkage of lymphoid tissue. This is a result which has not so infrequently been observed as the final stages of a chronic tonsillitis. Where the menace from systemic infection is however not eliminated, systemic infection—heart trouble, kidney trouble, rheumatic phenomena—are just as frequently observed in cases of small, shrunken tonsils as they are in cases of tonsils that are hypertrophied, and the relief obtained from

the removal of such tonsils is as frequently as spectacular as in the removal of the hypertrophied type. Where the reduction in size of the tonsil alone is aimed at, radiology has a logical place in our therapeutics, but this after all is rather a rare indication. Studies so far made of patients treated by irradiation have not justified any very enthusiastic acceptance of this form of treatment, but we feel that the final word about this matter has not yet been said.—Ed.]

Roentgen Ray Therapy in Chronic Pharyngitis and Tonsillitis. According to W. D. Witherbee[7] the three basic principles involved in *x*-ray treatment of chronic pharyngitis and tonsillitis are: (1) Destruction and absorption of the lymphocytes in the infected lymphoid tissues by the *x*-rays. (2) Drainage and eversion of the crypts of all the lymph structures involved. (3) Immunity of the tissues produced by small doses of roentgen rays, thereby protecting the patient from recurrent attacks of pharyngitis and tonsillitis.

Two months after a series of treatments the tonsils and the adjacent lymph structures are reduced to a firm and fibrous mass, whose size depends on the amount of fibrous tissue present before treatment began—itself the result of the recurrent infections of pharynx and tonsil. Those who claim that roentgen ray treatment increases fibrous tissue are not aware that the only successful procedure in the prevention of excessive formation of fibrous tissue (keloid) up to the present time is radiation. Of cases of pharyngitis and tonsillitis treated by roentgen rays, 80 per cent. have been free from recurrent attacks for 2-3 years. Cultures made from throats after treatment have been free from pathogenic micro-organisms from a few days to several months.

Roentgenotherapy g i v e n previous to operation materially lessens the amount of dissection necessary,

(7) Jour. Ophth., Otol. and Laryngol., November, 1924.

thereby decreasing the possibility of complications. The treatment is recommended in cases where an anesthetic or operation is contraindicated, in arteriosclerotic patients, where hemorrhage may cause complications, in patients whose tonsils are so imbedded in infected tissue that operation is liable to cause dissemination of septic emboli, in patients with marked infection in nearby lymphatic structures, in those suffering with chronic cardiac or renal disease, or any condition that has lowered the general resistance, and in patients subject to peritonsillar abscess. It is also applicable in cases where patients still suffer with recurrent attacks of pharyngitis after removal of tonsils and adenoids. The author has treated over 2,000 cases in his private office.

The Roentgen Ray Treatment of Tonsils and Adenoids. A. L. Yocum, Jr.[8] states that the treatment is generally given with the tonsil applicator of the water-cooled lamp, which affords an excellent light for visualizing the throat.

After two treatments a purulent or aqueous material exudes from some of the tonsillar crypts. This can be easily expressed by making gentle pressure with two wooden tongue blades, one behind and one in front of the tonsil. If one or more white or yellow spots are noted sealed to the surface of the tonsil they can be easily punctured with a sharp pointed knife. It has been demonstrated that there is no danger to the lymphatic glands, thyroid, pituitary or any other tissues from roentgen radiation.

After 4-6 weeks the tonsils begin to atrophy, and the highest degree of improvement is reached at the end of 6 months; the tonsillar pillars are then smooth and velvety. The lymphoid islands in the posterior pharynx are also atrophied. Chronic otitis media in children is usually cured. Diphtheria carriers are cleaned up by this method, 80 per cent. of whom are free from

(8) Jour. Radiol., January, 1925.

diphtheria bacilli after one week. There is no pain attached to the treatment, and many children go to sleep on the table.

The Roentgen Ray Treatment of Diseased Tonsils and Adenoids. According to H. G. Edwards[9] the selective action of the roentgen rays on the tonsillar tissue is no longer questioned, and is explained by the fact that the structural characteristics which determine susceptibility to irradiation are of a cellular nature: undifferentiated cells, hyperchromatic nuclei, vascularity, especially when due to an abundance of delicate capillaries, and absence of much intercellular substance. It is known that acute and subacute inflammatory tissues are characterized by lymphocytes,—round cells. These are the least resistant of all pathological cells and are most readily influenced by the application of the roentgen rays.

Atrophy of the tonsil is due to the absorption of the immature lymphatic cells in the follicles, lessening the depth and distortion of the crypts and at the same time causing an eversion and evacuation of contents. The destruction of the lymphoid cells is associated with endarteritis obliterans and, finally, formation of the dense connective tissue.

Roentgen ray treatment is especially indicated in cases of hypertrophy with vegetation in the nasopharynx, and in cases complicated by hemophilia, cardiovascular conditions, Bright's disease, chlorosis, or tuberculosis. With surgical treatment, there is the danger always attendant on the taking of a general anesthetic, and if the operation is performed under a local anesthetic, one cannot be sure that the patient will be free from pain and anxiety. Moreover, alarming hemorrhage may occur. Sequela, such as septic emboli, lung abscess, empyema, phlebitis, endocarditis, middle ear and mastoid infection, may retard recovery. Furthermore, the results of surgery are often unsatis-

(9) New Orleans Med. and Surg. Jour., April, 1925.

factory because hypertrophy can recur, and excessive lymphoid tissue still remains in the nasopharynx.

Following roentgen ray treatment, there are no known complications, provided the technic is properly carried out. Dryness of the throat and occasional swelling of the parotid and submaxillary glands have been the only disagreeable after-effects, and these usually subside in a few hours. In a series of more than 70 cases, of all types, which the author has observed from 1 to 3 years, in which the patients suffered from recurrent attacks of tonsillitis and pharyngitis, more than 80 per cent. have been relieved by roentgen ray treatment. Good results were also obtained in cases of recurrent pharyngitis, following removal of the tonsils and adenoids. As a result of roentgen ray treatment, the size of the tonsil is reduced, and the irregular, nodulated, ragged, or spongy tonsil becomes smooth, firm and pale, as when normal physiological atrophy takes place.

Radium Treatment of Tonsils. This paper by C. A. Simpson,[1] is based on three years' experience in roentgen and radium therapy of enlarged and hypertrophied tonsils. All tonsils that have been treated by roentgen rays alone show definite masses of lymphatic tissue in the tonsillar fossa. The results of such treatment do not compare favorably with those following the application of radium directly on or into the tonsil. The author has discarded radium needles and metal covered plaques. The plaque which he has employed since 1921 contains less than 30 mg. radium, spread over a surface of 2 sq. cm. It is oval in shape with rounded edges and no corners, and the window is covered with a rubber composition that filters out less than 2 per cent. of beta rays. Its advantage is that more beta rays (which have a bactericidal action) than gamma rays reach the tonsil.

The tonsil is swabbed with a 2 per cent. cocain solu-

(1) Amer. Jour. Roentgenol., December, 1924.

tion, and the plaque is attached to a compass-shaped tonsil hemostat which retains the open unfiltered window of the plaque directly against the surface of the tonsil, where it remains thirty minutes for each tonsil. A dental suction tube carries off the saliva. This treatment can be employed only for older children and adults. One treatment will diminish the average tonsil as much as four or five applications of roentgen irradiation. The largest tonsils have never required more than four treatments at three week intervals, and the average case requires three treatments.

In adult patients with sensitive throats, in children and in cases where quick results are desirable, the author has been employing glass emanation seeds of varying strength. While 0.5-1 mc. secures quick and pronounced atrophy, the accompanying reaction and pain make their use impractical, and the writer now uses emanation seeds of not more than 0.25 mc. in strength. He first paints each tonsil with a 2 per cent. cocain solution and has the patient gag. The average sized tonsil can easily hold 2 seeds. Extreme care should be exercised not to have either seed nearer a pillar nor to have them nearer together than 0.5 cm. It is important to withdraw the curved-tip trocar slightly before the stylet pushes home the seed.

At the end of eight or ten days the tonsil becomes pale and a decrease in size is noted. This shrinkage progresses during the next two weeks, at the end of which time not a vestige of a previously protruding tonsil may be seen. Close adherence to this technic will produce the most complete atrophy and destruction of tonsillar tissue. Repeating a treatment too soon is harmful. If one application of properly placed emanation seeds will not clear the fossa of all lymphatic tissue, two or possibly three treatments will, invariably and constantly. Radium atrophy of tonsils constitutes a real advance in medicine, and is indicated in patients who, because of constitutional defects and

lesions, should not be subjected to the risks, pain and prostration of an operation.

Removal of Tonsils by Electro-Coagulation. While electro-coagulation may have some salient features to commend it, experience has taught A. C. Carlton[2] that it is not a procedure to be employed in every case by anyone, but might become an adjunct to those accustomed to performing tonsillectomies in certain selected cases, when the proper technic and understanding has been acquired.

The operation itself can be performed in the course of a few minutes under local anesthesia, but the after effects are of consequence, and to destroy tonsils completely at one operation requires skill and experience. Postoperative conditions are comparatively the same as those following tonsillectomies, varying with the individuality, and the attendant discomfort must be cared for accordingly. There is also the additional necessity for disposing of the tonsil slough and caring for the inflammation produced by the electric burn which in some instances, if one is not careful, affects the surrounding pillars.

The acquisition of a working knowledge for the control of the current is incumbent upon the operator, that he may keep it confined within the tonsil tissue to be destroyed. The current is invisible and unlike the galvano-cautery, which is red hot, shows only the result, the coagulated area affected by it.

Under the influence of a local anesthetic, coagulation is painless, hemostatic, sterilizing, without shock or physical taxation and commends itself to timid patients and those who for constitutional reasons should avoid general anesthesia, loss of blood or mental stress. Likewise to those who cannot afford hospitalization, loss of time from work or loss of income, electro-coagulation has its useful purposes.

The destruction of tonsils by the electric current is

(2) Calif. and Western Med., November, 1924.

not new, but recent improvements in apparatus and methods have brought it into prominence and for the past eight months the author has used it in at least 50 instances for the destruction of tonsils, turbinates and pharyngeal hypertrophies.

The amount of tissues to be destroyed at one sitting is important. Small cryptic, imbedded, fragile tonsils or tonsillar remnants of previous operations, so difficult to dissect, are ideal for electro-coagulation. Hypertrophied tonsils are not as suitable for destruction at one sitting, but can be done in two or more stages at intervals of three to four weeks, because the smaller the area to be destroyed the less current is required and the less reaction results and the minimum discomfort exists. The milliamperemeter is absolutely necessary for measuring the quantity of current used. The softest current that will deliver 300 to 400 milliamperes by careful adjustment of the apparatus is most desired.

It must be borne in mind that the current passes into the tissue from the needle in all directions, including the point, and one must exercise care and judgment in the insertion of the needle as to depth and direction.

The depth of the tonsil must be estimated and at least one-eighth inch radiation allowed for in all directions, including the tip, so that no damage be done to pillars or floor. The Plank needle is flexible and can be bent in the direction best suited to parallel the pillars, not point at or into them. On the average, the needle need be inserted about one-quarter inch, and not in excess of one-half inch, to destroy small cryptic tonsils to the capsule, other sizes in proportion.

When the effects of the anesthesia have worn off, such pain and discomfort as may exist for the subsequent twenty-four hours or so, can be cared for as with tonsillectomies. About the fourth or fifth day the sequestrum formed from the coagulated tissue par-

tially liquefies and a fetid odor is noted from the necrosed tissue.

Under no circumstance should the slough be forcibly removed or quantities of coarse food be taken during this period, as it will cause bleeding. When the slough separates it can be gently wiped out. The fossae should be cleared by the tenth or twelfth day and healing is complete within a few days thereafter, leaving the contour of the throat and pillars in normal condition, without deformity or adhesions. During the sloughing period the patient may resume his occupation with little discomfort.

Quite different from tonsillectomy, should for any reason, small particles of tonsil tissue remain, it is a very small matter to dispose of them by electro-coagulation, without trouble to the operator or loss of time or expense to the patient. The removal of small particles of tissue cause little or no reaction and need no subsequent attention.

For the patient with systemic disease due to focal infection with suspicion directed to tonsils having no visible evidences of infection where one is hesitant to incur unnecessary expense, electro-coagulation can be recommended as an easy, economic method of disposing of a possible cause with the least amount of stress upon the already diseased burdened system.

The author believes that electro-coagulation of tonsils will find its place, when methods of operation and apparatus will have become standardized, for selected cases as herein mentioned.

Carcinoma of the Tonsil. Malignant involvement of the tonsil is principally a disease of the male, less than 20 per cent. occurring in the female. Carcinoma seldom occurs below 50, its average age of incidence being 56, while sarcoma may occur at any age, its average being 47. This really gives a false impression, as the age of the sarcomatous patient is commonly below 40, but the average is elevated by the presence of the dis-

case in a few very much older patients. The age of the carcinomatous patient is less varying. In the differential diagnosis between carcinoma and sarcoma, much has been said of the lateness of the glandular involvement in the case of the latter. This is true of sarcoma everywhere but in the tonsil. Glandular involvement may be just as marked and just as early an occurrence as in the case of carcinoma. Malignant diseases can easily be differentiated from simple hypertrophies, peritonsillar abscess, lupus, diphtheria, Vincent's and syphilis by the history, inspection, palpation, blood test and biopsy.

In a review of the literature M. Ross[3] found that of malignant growths of the tonsil published since 1910, a series of 37 cases were obtained in which diagnosis was definitely established by microscopic examination. Clinical diagnosis alone was not accepted in this series. Of this number, 20 were carcinoma and 17 sarcoma. Of the 20 cases of carcinoma, no less than fifteen occurred on the left side, while one was bilateral, but more markedly involved on the left side, while only 4 cases were confined to the right tonsil. This gives an incidence of occurrence on the left side of 80 per cent.

Of the 17 cases of sarcoma, 11 occurred on the right side and 5 on the left, one bilateral case showing a greater degree of involvement on the right side. If this is true, and is substantiated by further reports, it not only is a point of interest, but may be of some diagnostic value in differentiating the two great groups of malignancy of the tonsil.

Recently there has been some discussion as to whether epithelioma of the tonsil has its origin in the epithelium of the tonsil proper or its adjoining pillars. Whenever epithelium normally or abnormally tends to change its type, such a change is more likely to produce epithelioma than the center of an epithelial area. This is well shown in malignant disease of lips or anus,

(3) Laryngoscope, January, 1925.

where carcinoma seems to have a predilection for the muco-cutaneous junction. This same factor may be applied to the tonsil, the favorite site, therefore, being at junction of the epithelial surface of tonsil and pillar. An established fact is, that, at the age when carcinoma is more prevalent, the tonsil, if any exists, has, regularly as we approach its center, a stabilized though proliferated epithelium covering it. Such activity and tendency to mutation as persists is chiefly at the periphery. There, also, it is more exposed to attrition and injury. For these reasons one would, *a priori*, expect a greater incidence of incipient cancer in this peripheral zone, whether in or just outside the tonsillar tissue proper.

From the statistics, it would be almost impossible to establish the validity of such an hypothesis, because the reports of cancer of the tonsil allude to more or less advanced disease which would preclude the possibility of saying, even if it is already situated in the tonsil, whether or not it really began there.

As to treatment, surgery, diathermy, *x*-ray and radium all have their exponents. Each of these therapeutic measures undoubtedly has its own sphere of usefulness. A study of results in a great number of cases reveals the need for more heroic treatment. It is not uncommon to hear of cancer in other parts of the body seemingly cured. In the tonsil this is exceptionally rare. Death is almost the invariable result within two years. This being the case, the opponents of surgery score their most damaging point: if death is to ensue within two years, why subject the patient to the added burden of operation when radium will produce the same palliative result without any discomfort? The answer to this might be in the nature of a plea—a plea for earlier recognition of the disease. A cure can only be hoped for when the tumor mass has not extended beyond a point where complete eradication is possible. If the case presents a diffuse infiltra-

tion with glandular involvement, complete extirpation is scarcely feasible. Surgery, except for mechanical relief in an emergency, is then not only of no advantage, but is distinctly contraindicated. In those cases, however, where the growth appears localized, radical removal with resection of the glands of the neck and ligation of the external carotid artery and facial vein, followed by a course of radium treatment seems to hold out greatest hope.

In this connection the dangers of delayed diagnosis cannot be over-emphasized. The time consumed in repeated blood examinations, therapeutic tests and observation of the progress of the case, often permits an operative case to reach the inoperative stage. Any unilateral enlargement of the tonsil in an adult should always be regarded with grave suspicion and treated that way until proven otherwise.

The author reports a case of carcinoma of the tonsil in a man, aged 53 years. After three months of observation under radium treatment the condition shows a distinct improvement.

The Relation of Prolonged Coagulation Time to Hemorrhage from Tonsillectomy. J. H. Harter[4] reports a series of 418 patients, most of whom were children, apparently without general disease, on whom the usual tonsil and adenoid operation had been performed. In 115 cases the coagulation time was eight minutes or longer; in 21 cases, it was ten to fifteen minutes. Of the 16 patients who had profuse bleeding at the time of operation, 14 had a coagulation time of seven minutes or under, one eight minutes, and one ten minutes. Postoperative bleeding required attention in 11 patients, 10 of whom had a coagulation time of seven minutes or under, and one of nine minutes.

These figures do not indicate any definite relation between prolonged coagulation time and hemorrhage from tonsillectomy. If a high coagulation time (over

(4) Northwest Med., November, 1924.

seven minutes by the capillary tube method) is found before tonsillectomy, the following diseases should be ruled out by careful history and physical examination: hemophilia, anemia, leukemia, purpura hemorrhagica, diseases of the liver, phosphorus or chloroform poisoning, yellow fever, miliary tuberculosis.

If none of these diseases is found, the coagulation time can usually be shortened by internal administration of calcium salts or by hypodermic injection of some of the newer aids to coagulation. In all patients brought for examination, any evidence of a history of excessive bleeding should be carefully followed up, and the coagulation and bleeding time determined. If hemophilia is diagnosed, no operation should be performed except as a life-saving measure.

[In private practice where one has an opportunity of going into the history of a patient more carefully, there is no necessity for making coagulation tests in all cases. Where there is any danger due to slow coagulation, troublesome bleeding can be easily gotten from the history. Where there is any suspicion, coagulation tests can be made.

In dispensary practice the situation is somewhat different. One does not have the same opportunity of getting an intelligent history and in order to prevent some catastrophe like operating in a hemophiliac, it is desirable to test coagulation time in all these patients. -Ed.]

Lung Abscess Following Tonsillectomy. A great deal of reflection and study has been devoted to the subject of lung abscess following tonsillectomy. At the present time there are two main theories of its origin. One is that the lung suppuration is usually due to the aspiration of adenoid or tonsil tissue, or of potentially infective blood and mucus, or the crypt content or any combination of these. The other is that a septic embolus becomes dislodged from one of the thrombosed vessels in the operative area, and finally settles in the lung where an abscess is initiated.

According to M. C. Myerson[5] the symptomatology of lung abscess is as follows: The patient may recall that immediately after operation he did not feel very well; or he may have felt perfectly well until the sixth to the fourteenth day, when he had a sudden pain in the chest and began to cough and expectorate a varying amount of foul smelling sputum.

If lung abscesses occurred in the manner claimed by the proponents of the aspiration theory, it should follow that all these suppurations would communicate with the bronchial tree. If post-tonsillectomy abscesses were encountered which did not communicate with the bronchi, we would have a very strong case against aspiration. The author therefore communicated with several workers who were particularly interested in these lung suppurations, requesting information as to whether the person addressed had ever encountered a lung abscess following tonsillectomy which did not communicate with the bronchial tree.

Several replies were received in which the writers mentioned abscesses not communicating with a bronchus and which were probably embolic in origin. However, in the main, the belief was prevalent that the majority of these abscesses resulted from aspiration, and were connected with the bronchial tree.

As a result of his study the author concludes that:

It is not the aspiration of tonsillectomy mixture that is important in the production of lung abscess following tonsillectomy, but the failure of a given portion of the lung to expel the content that is aspirated.

A normal lung bed and bronchial tree would indicate a normal expulsion force.

Lung tissue and smaller bronchial elements temporarily damaged by increased concentration and prolonged administration of ether, or permanently damaged by influenza, pneumonia or tuberculosis, indicate an inability to expel aspirated material. This involved

(5) Arch. Otolaryngol., February, 1925.

area becomes the site of election of a suppurative lesion.

This study indicates that all tonsillectomy patients should be given a careful preoperative survey, with special reference to the pulmonary tract. More accurate and complete histories should be taken in these patients, to rule out previous pulmonary disease. Physical examinations should be performed as a routine. It should always be our aim to avoid the distressing complication of lung abscess. In the presence of known pulmonary disease, we should be forewarned and plan our operative procedure accordingly.

[It is rather surprising that there are not more lung abscesses when one observes the methods used in doing a tonsillectomy. The upright position would seem to be the one most favorable for inhalation of infectious material from the tonsils during the operation. Patients lying on the back with their throats filled with blood is not the best method of preventing inhalation. Patients lying on the side with the operator sitting down would seem to offer the best means of preventing inhalation. In this position the blood readily runs out of the mouth. It is no more difficult to do a tonsillectomy in one position than in another. Those who still persist in doing the tonsillectomy in the upright position do so because they have gotten into the habit of doing it that way. The same thing is true of doing a tonsillectomy with the patient lying on the back. It is no more inconvenient to operate with the patient lying on the side with the blood running out of the mouth than in another position where the blood is inhaled or swallowed.

In view of the occurrence of brain abscess after tonsillectomy which are certainly of embolic origin, it would seem likely that a lung abscess of embolic origin is also possible.—Ed.]

Infection of the Tonsilloglottic Region Associated with Cervical Cellulitis. V. Dabney* feels that when

(*) Jour. Amer. Med. Ass'n., July 11, 1925.

the pus of a peritonsillar abscess is not evacuated after several careful attempts, the danger of the infection penetrating deeply along the planes of fascia and even into the mediastinum is real and ever present, and delay for it to break through one of the old incisions is a serious responsibility and very grave error of surgical judgment. After waiting two or three days the writer has not hesitated to remove the tonsil in order to provide adequate drainage.

The lesson the author has learned from his series of cases is that swelling of the neck associated with a respiratory infection is a grave disorder and is to be treated with vigilant and immediate care. The cause is generally to be found if careful search is made, and its removal is generally possible, which, if done early, will reduce a mortality from about 75 per cent. to about 2 per cent. In these cases external application of ice and inhalation of impregnated steam, saline purgation, and the use of morphin for rest are highly successful.

The author states that the erysipelas-like behavior of these cases is striking, and in his own cases at least, the streptococcus was causative. All of the writer's cases showed albuminuria and edema of the glottic region and, later or earlier, cellulitis. As far as could be determined, the edema was not due to any cardiac or renal disease primarily. Incision through the neck into the cervical abscess, when this exists is, of course, entirely justifiable. Unfortunately, however, when the necessity for this becomes apparent either the patient is too septic or the myocarditis too far advanced to permit a successful issue by operation.

The Nasopharynx

Nasopharyngeal Growths. Growths encountered in this region may be fibromas, angiomas, sarcomas, endo-

theliomas, carcinomas or chondrosarcomas. W. Milligan[6] discusses these conditions as follows:

1. Fibromas: Although these are histologically benign, not causing metastasis, their clinical course may be described as almost malignant. The exact site of origin is often difficult to determine. The ones most amenable to surgical interference are those springing from the vault, from the mucoperiosteum of the basisphenoid, especially those possessing a pedicle. They are seen in males, in the early years of life, and most often spring from the left side of the nasopharynx. Points emphasized in the treatment of nasopharyngeal fibromas are the value of a preliminary irradiation of the growth and of a lateral rhinotomy in assisting to determine its exact origin and also as an aid to its ultimate removal, and the necessity of not relying too implicitly on the histologic examination of a fragment of the growth.

2. Angiomas: These are very rare and do not tend to invade neighboring cavities. The author regards radium as the treatment of choice.

3. Sarcomas: The insertion of radium in these growths has an almost miraculous effect, but unfortunately an evanescent one.

4. Endotheliomas: These are comparatively benign; in their destruction diathermy finds a useful place.

5. Carcinomas: Here surgery has a very limited sphere of usefulness. The author has not seen a single case in which life has been prolonged more than a few months. Three symptoms to be kept in mind are recurring spontaneous hemorrhage, recurring attacks of unilateral seromucous catarrh of the middle ear, and persistent otalgia without objective signs of inflammatory reaction. The author's experiences with radium in the treatment of these cases has been disappointing.

The Treatment of Malignant Tumors of the Pharynx and Nasopharynx. In the treatment of malignant

(6) Jour. Laryngol. and Otol., October, 1924.

tumors of the pharynx and nasopharynx, the method of treatment or combination of methods best suited to the particular type of growth should be employed. It is known that the cases in the sarcoma group such as the lymphosarcomata, are best treated by radium or *x*-ray, rather than by operation, and that certain epitheliomata of the pharynx respond more readily to cautery and surgical treatment, while others are better treated by *x*-ray and radium.

G. B. New[7] reports a series of malignant tumors of the nasopharynx, pharynx and hypopharynx. The cases are divided into those amenable to treatment and those in whom the lesions were so extensive that treatment would be of no value. In those cases treated by radium the agent was inserted with emanation seeds or needles directly into the growth, or applied outside the neck.

The author summarizes his results as follows:

Malignant tumors of the pharynx and nasopharynx are usually of a very high grade of malignancy, either lymphosarcomata or epitheliomata, Grade 3 or 4 (Broders). In the treatment and the prognosis of pharyngeal tumors, Broder's gradation of epitheliomata is of definite clinical value.

Discrimination is necessary in the selection of patients with malignant conditions of the pharynx and nasopharynx, whose tumors are very extensive, as in certain instances the treatment given is detrimental rather than beneficial.

The patients who are treated should receive thorough and radical treatment, which may consist of surgery, cautery or diathermy, radium or *x*-ray, or any combination of these methods, as indicated.

Most of the patients treated received marked symptomatic relief; some had their lives prolonged for months or even years, while others are apparently cured.

(7) Surg., Gynec. and Obst., February, 1925.

Mixed tumors of the pharynx should be removed surgically, if possible and other forms of treatment used if they are inoperable.

Tortuosity of the Internal Carotid in Relation to the Pharynx. The projection of the artery is usually in the posterolateral region of the pharynx. It is bilateral in one-third of the cases. The identity of the artery involved has been questioned; but, compression and palpation show it to be the internal carotid and not the ascending pharyngeal or the vertebral. This view is borne out by the study of anatomic dissections of these anamolies. A. B. Kelly[8] discusses several of the cases reported in the literature and reproduces several sketches.

Some patients show more of a pulsation in the pharynx than actual bulging, and from the cases studied it is concluded that tortuosity is more common in females; mostly in children and old people; more often on the right side.

In the embryo, the artery originates from the third aortic arch and the dorsal aorta. At the fifth week, where these portions join there is a decided bend forward and this bend is crossed by the ninth nerve. As the heart recedes into the thorax the artery is straightened out. It is conceivable that if there is greater relative growth of either part of the artery the bend will persist. In support of this view it is pointed out that in these cases: (1) the tortuosity is medial or forward as was the embryonic bend; (2) the tortuosity is crossed by the ninth nerve; (3) the tortuosity is frequently bilateral, suggesting a common cause.

In the young, the prominent pulsating vessels are probably congenital. In the old, high blood pressure and atheroma may be factors; but they did not seem to be prominent features in this series of cases.

The diagnosis is made by observing a bulging in the

(8) Jour. Laryngol. and Otol., January, 1925.

posterolateral pharyngeal wall, possibly bilateral, pulsating synchronously with the heart, covered by smooth, healthy mucosa, the absence of any symptoms referable to the swelling and the unchanging size over a period of time. It must be distinguished from aneurysm. There are very few accidents reported due to these vessels; but the author advises caution when interfering surgically where there is pulsation around the tonsil.

Bacteriologic Study of the Nasopharynx in Patients Treated with Chlorin Inhalations. The following summary is made by M. B. Patterson[9] on the basis of a bacteriologic study of the mucus, swabbed from the nasopharynx of individuals treated with chlorin gas:

1. Patients breathing an atmosphere containing 0.015 mg. chlorin for a period of one hour showed some alteration of the microbic flora of the nasopharynx, chiefly in the direction of diminution in quantity of bacteria, affecting more especially the hemolytic streptococci and the diphtheroids.

2. Blood agar plates inoculated with pure cultures of some common pharyngeal bacteria, and then exposed in an atmosphere containing 0.015 mg. chlorin per liter for various intervals up to 120 minutes, showed very little or no effect of the gas on the subsequent development of the bacteria, except in the plates exposed for more than ninety minutes.

3. A chlorin concentration of 0.020 mg. per liter of air gave a distinctly more appreciable reduction in the bacteria of the nasopharyngeal mucus in the patients, and exhibited a distinctly greater inhibitory effect on the plate cultures exposed to it.

4. The bacteria suspended in the air itself appear to be very largely destroyed by the chlorin.

The author concludes that:

1. Sterilization of the respiratory mucous membrane by inhalation of chlorin in a concentration of 0.015 to

(9) Arch. Otolaryngol., January, 1925.

0.020 mg. per liter of air for an hour or two is not to be expected.

2. The concentrations of chlorin used to exert an effect, however, and often this may be in the direction of microbe reduction, of possible assistance to the body defenses in combating superficial infection.

3. Although chlorin inhalation is not without possibility of injury, its extensive application to acute superficial respiratory inflammations, under suitable scientific control, appears justified in the light of the laboratory studies. The ultimate decision as to its value must be based on extensive clinical trial.

(See editorial comment after article "Chlorin in Respiratory Diseases.")

Roentgenographic Demonstration of Adenoids. C. C. Grandy* has found that the presence of adenoid tissue can be diagnosed from the *x*-ray picture. Roentgenographically the nasopharynx shows dark in the lateral view of the head and neck, and since the adenoid tissue lies on the roof and posterior wall, it is the posterior boundary of the nasopharyngeal space. When the adenoid is enlarged the air passage can be seen to be reduced in size in this region by a mass of uniform density. The differential diagnosis must include retropharyngeal abscess, tumors extending into the post nasal space and malignant infiltration.

[The employment of skiagraphy in the diagnosis of adenoids seems to us unnecessary. Any properly trained rhinologist can make this diagnosis without any difficulty.—Ed.]

Treatment of Fibromas of the Nasopharynx; Report of Thirty-two Cases. According to G. B. New and F. A. Figi[1] fibromas of the nasopharynx present a typical clinical picture: they have a definite life cycle, starting to grow at about puberty, and continuing are active until the age of about 25 years. The tumor is amen-

(*) Amer. Jour. Roentgenol. and Rad. Therap., August, 1925.
(1) Ann. Otol., Rhinol., and Laryngol., March, 1925.

able to treatment in older patients, since there seems to be a spontaneous retrogression after the age of 23 or 25 years. The tumor, which is hard, may be pedunculated or have a broad sessile base. It may have several attachments due to ulceration, and may fill the greater part of the nasopharynx. In ten of the authors' series the tumor was confined to the nasopharynx alone, and in thirteen it had extended to both nostrils. The antrum was involved on one side in two cases and the palate in three. The tumor had apparently originated in the right side of the nasopharynx in eighteen cases, in the left side in nine, in the median line in three, and in one case the point of origin was not determined.

Fibromas of the nasopharynx are microscopically benign and clinically malignant. This type of tumor does not metastasize, but may, owing to its location and extension into the skull, cause death. In some of the earlier cases, tissue was removed for microscopic examination; this proved to be fibroma, fibro-angioma or fibromyxoma. In a few cases the specimen was reported inflammatory, due to the reaction from repeated previous operations and treatments. In the last four years no attempt has been made to obtain tissue, on account of the bleeding which accompanies such a procedure. The diagnosis is based on the history, the hardness of the tumor, the age of the patient and the clinical picture.

Of the thirty-two patients reported by the authors, eight were treated before the use of radium, and twenty-four, after the use of radium. Of the eight patients five were operated on; there being two deaths. Using radium, fifteen out of the 24 patients were cured.

In their recent cases the authors have applied the radium in the form of 0.5 to 1 mc. emanation seeds, implanted directly into the tumor. The number of seeds depends on the size of the tumor. The treatments are repeated at six weeks to two or three months

depending on the reaction and the result of the previous treatment. The number of applications varied in the authors' series from two to nine, averaging five to six.

A Diathermy Snare for Removal of Postnasal Growths. The snare devised by E. B. Barnes[2] consists of a vulcanite body, with metal liner with solid end, into which the diathermy cable screws. In the liner of the body of the snare is a hollow metal slide. The wire, which is of hard drawn silver, is passed through the stem of the snare into this slide, and a vulcanite-headed screw works through a slot in the body into the slide and grips the wire in it.

Fig. 56.—Section of diathermy snare.

The case in which the author used the snare was that of a boy of 13 with an angio-fibroma springing from the basisphenoid by a pedicle half an inch broad and a quarter of an inch thick. The tumor was about 1 in. long by 1 by three-fourths in., and showed below the soft palate. The wire was passed through the mouth over the pedicle and forced against the basisphenoid with the finger-nail. It was then tightened and the current was switched on at a fairly high amperage. The tumor fell off in about three seconds. There was no stain of blood. At no time after the operation did the child have any pain at all. Five weeks later the author was unable to detect any sign of growth. Apart from the simplicity of the procedure and freedom from hemorrhage with the diathermy snare, it seems probable that there will be less liability to recurrence after the use of the diathermy snare than if the tumor had been removed by ordinary surgical procedures. (Fig. 56.)

(2) Brit. Med. Jour., Jan. 31, 1925.

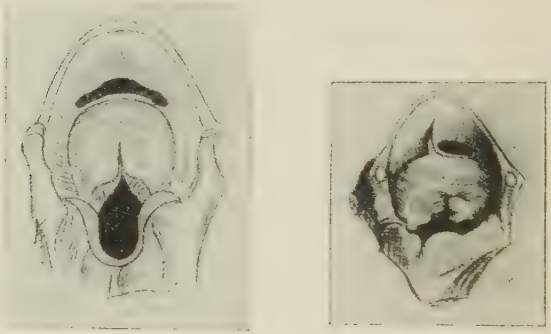
Asymmetry of the Mouth of the Esophagus and Retropharyngeal Diverticula. In recent observations on asymmetry of the thyroid cartilage and the mouth of the esophagus H. P. Mosher[3] has observed cricoid webs in the cadaver and in the living; asymmetry of the pyriform sinuses, of the thyroid cartilage and the mouth of the esophagus; the mechanism of pouches of the upper end of the esophagus, and asymmetry as a possible cause for the starting of such pouches. He has found asymmetry of the thyroid cartilage, the pyriform sinuses and the mouth of the esophagus to be quite common, as are also postcricoid webs which turn one or both pyriform sinuses into pockets. The cricoid cartilage acts as a real stopper to the mouth of the esophagus.

A sufficient deformity of the pyriform sinus or of the mouth of the esophagus throws the muscle strain in swallowing off center. A postcricoid web makes an actual pouch on the lateral wall of the pharynx at the level of the top of the cricoid cartilage. Esophageal pouches may start at the top of the cricoid cartilage or at the bottom; they occur in two forms, the small pouch with a wide anteroposterior mouth and the larger pouch with a narrow anteroposterior mouth. The larger pouches appear to be pedunculated and often extend into the thorax.

The hernia of the esophageal mucosa does not necessarily occur through the lower part of the weak triangle of the posterior esophageal wall, but may occur through the lower part of the inferior constrictor muscle. Anteroposterior *x*-ray plates of pouches show that the width of the mouth of a pouch is the width of the lower pharynx. That is why it is so easy to enter the pouch. Experimental esophageal pouches show that the drag of the pouch narrows the mouth

(3) Laryngoscope. November, 1924.

of the esophagus to a slit, closely applied to the posterior surface of the cricoid cartilage. The reduction of the pouch or its ablation at once restores the lumen of the esophagus to its natural size. (Fig. 57.)



A *B*

Fig. 57.—*A*, Specimen of a larynx and the upper end of the esophagus showing the size and shape of the opening at the beginning of the esophagus. Reduced one-half. *B*, Web of the esophagus. Specimen of a larynx and the upper end of the esophagus showing a single web springing from the upper rim of the posterior surface of the cricoid cartilage a little to the right of the median line. The esophageal opening is small and is found to the left of the web. The lumen of the right half of the beginning of the esophagus is obliterated. Reduced one-half.

The Importance of Early Diagnosis of Esophageal Lesions. According to J. M. Waugh,* the early diagnosis in cases of nonmalignant lesions makes possible the prompt institution of proper treatment to relieve the symptoms and avoid a malignant sequel, and in cases of malignancy assures the earliest possible chance of amelioration and possible, even though improbable cure.

The significant symptoms of esophageal lesions are dysphagia, regurgitation of food, and the coughing up of more or less mucus. The conditions which must be differentiated are carcinoma, diverticulum and the

(*) Wisconsin Med. Jour., August, 1925.

so-called cardiospasm. The author discusses the various methods of diagnosis in these cases. He emphasizes the point that fluoroscopic and *x*-ray examination may fail to disclose the true nature of the esophageal lesion. Thus, in several cases, the *x*-ray picture was suggestive of cardiospasm whereas the real lesion was a carcinoma. In order to make an accurate diagnosis the author strongly urges the use of the esophagoscope. With this instrument the lesion may actually be observed and diagnosed. It should be used in every case in conjunction with the fluoroscopic and *x*-ray studies. By this means early diagnosis can be made and treatment instituted before the lesion has advanced too far.

In esophageal ulceration it should be borne in mind that: (1) ulcers caused by a foreign body or corrosive agent are found above a stricture; (2) tertiary syphilitic lesions are exceedingly rare; and (3) tuberculous ulceration is not characterized by inflammatory appearances, the edges are not raised and the surface does not bleed easily when sponged. The only real contraindications to esophagoscopy, and they are important, are, acute esophagitis, and water hunger.

In the author's series of 72 esophageal cases, there were 19 cases of esophagospasm, 3 of obstruction, 6 of stricture, 3 of ulcer, 12 of diverticulum, and 29 of carcinoma. In conclusion the author urges the cooperation of the patient, practitioner, specialist and roentgenologist in order to arrive at a diagnosis at the earliest moment.

Radium Therapy in Cancer of the Esophagus. The Results of Fifteen Years' Experience. Malignant strictures of the gullet may, for practical purposes be regarded as outside the limits of radical surgery. We are reduced to palliative measures. The local means at our disposal are, passage of bougies, intubation, endoscopic removal of portions of the growth, galvanocautery, and endo-esophageal application of radium salts.

Sarcomas yield more readily to radiation than carcinoma, and the softer forms of carcinoma are more readily affected than the harder growths.

The cases must be very carefully selected for radium application. Patients must be robust to stand the long exposure necessary, also to withstand any liberation of toxins that may take place. The annular growth must not be more than 5 cm. long.

The cooperation of a skilled radiographer is of value, but W. Hill[4] advises a careful endoscopic examination of the growth under a general anesthetic. If necessary, the stricture may be dilated with bougies. The length of the stricture is measured. The location is noted. Growths behind the trachea or left bronchus are unsuitable for radiation, owing to the danger of a fistula resulting.

It is necessary to radiate the entire length of the growth. The position of the radium in the container must be known. The dosage will vary with the strength of the radio-active substance, the thickness and quality of the container and the time of each application. The number of applications will be determined by the result of the first treatment. There is usually an interval of six weeks between the treatments, and after the first thorough examination, local anesthesia may be used.

In 77 patients treated by radium, one-third of the number showed remarkable improvement, in another third, there was moderate improvement, and in the remaining third there was very slight or no improvement. In three the procedure proved fatal within a few days.

The author concludes that radium therapy is of value in a proportion of carefully selected cases of malignant stricture of the gullet.

Results of Treatment of Carcinoma of the Esophagus by the Combined Use of Radium Emanations and the

(4) Jour. Laryngol. and Otol., February, 1925.

Deep Roentgen Ray. Three years ago D. C. Greene[5] reported the results in eighteen cases of cancer of the esophagus, treated by the implantation of radium emanation "seeds" under esophagoscopy. A temporary improvement, as evidenced by a greater ease in swallowing and a slight increase in weight, which lasted from a few weeks to a few months, was noted in most of the patients after this method of treatment. The improvement was only temporary in all cases, and the author was unable to report any patient who had survived for more than eight months after the beginning of treatment. Patients treated by the same method since that time have shown practically the same results. With the introduction of the high voltage roentgen ray treatment, it was hoped that a reinforcement of the effect of the radium emanations might be obtained which would produce more lasting benefit. In the present series of sixteen cases, extending over the last two years, all patients were treated both by radium emanations and the deep roentgen ray. In a few cases the roentgen ray treatment preceded the radium, but in the majority it was employed subsequent to or in conjunction with the radium treatment.

Esophagoscopy is usually performed under ether anesthesia. The appearance and characteristics of the lesion are noted, a small specimen removed for microscopic examination and the permeability of the stricture to bouginage observed, without any attempt at forcible dilatation. The radium emanation seeds are inserted into the growth with a trocar. A small olive shaped guard is placed 1 cm. from the tip, to assist in gauging the depth of insertion and obviate too deep penetration.

In delivering a given dosage of emanations, it has been found more effective to distribute the total amount in a number of small seeds than in a few larger ones. The smaller seeds also produce less sloughing

(5) Arch. Otolaryngol., January, 1925.

and are therefore less likely to result in perforating ulcers. In most cases from four to six seeds, of 1 cm. were inserted at each treatment. The immediate reaction to this instrumentation and treatment is slight and the patients are usually able to leave the hospital on the following day. Within a few days a decided improvement in swallowing is usually observed, which is doubtless to be attributed to the bouginage. The deep roentgen ray treatments have in most of the cases been given in a series of three or four exposures, extending over a period of from three to five days, beginning a few days after the radium treatment. In about eight weeks the roentgen ray treatment is repeated. At irregular intervals of about two months, the examination of the esophagus and radium treatment has also been repeated, but the author's impression has been that the most effective treatment has been the first one, and of late he has relied on the deep roentgen ray for therapy after the initial treatment.

Thus far the cases treated by the combined method have shown a slight improvement in results when compared with those treated by radium alone. Although the end-results so far have been disappointing, there are certain observations and deductions therefrom which give reason for some hope for better results in the future. In contrast with the 100 per cent. mortality after irradiation in esophageal cases, many patients have been apparently cured by irradiation where the disease has been located in the pharynx.

In conclusion the author recommends gastrostomy as soon as the diagnosis is made, and forbids the taking of any food by mouth. With rest and cleanliness of the esophagus thus induced and nutrition maintained, it seems reasonable to expect more favorable results from irradiation than have yet been obtainable.

Fracture of the Larynx. The larynx is fractured more frequently in adult life, probably on account of the greater exposure to injury at this time and to the increased calcification of the cartilages. T. F. Mullen[6] states that fracture may occur in any or all of the cartilages, but as a rule the thyroid is the one involved. Fractures of the cricoid and multiple fractures are usually accompanied by severe injury to the adjacent structures, thus determining the fatal issue so frequently seen in these types of break. Either one or both arytenoids may be separated from their attachments to the cricoid, permitting relaxation of the vocal cords.

Symptoms and Signs. St. Clair Thomson describes the usual symptoms as "local pain, tenderness and swelling, with more or less interference with phonation, mastication and deglutition. Hemoptysis may occur and is regarded as a particularly unfavorable sign as indicating that laceration of the mucous membrane had taken place. Pain is elicited by movement, swallowing and by handling the neck. Dyspnea may be marked and of extreme urgency. Asphyxia with its attendant signs may appear early or occur later, even in those who appear quite convalescent, being in these cases probably produced by the displacement of a piece of cartilage or by sudden emphysema. Ecchymosis of the neck, with marked cyanosis of the face and upper part of the thorax may be seen.

Manipulation of the larynx may disclose a fissure, show displacement, mobility of the fragments or crepitus, which should not be confounded with that produced by the normal larynx gliding over the anterior surface of the cervical vertebrae.

Laryngoscopic examination may reveal a pale edema

(6) Ann. Surg., November, 1924.

or redness and swelling, congestion or hemorrhage, and show to what extent respiration is interfered with. The false bands may be found to be reddened and swollen to a prodigious degree, causing stenosis of the glottis. The upper portion of the thyroid cartilage may be seen to be flattened and pushed into the larynx, or completely detached portions of cartilage may be seen. Bleeding points, tags of membrane or foreign bodies may be discovered.

Emphysema of the neck is a very serious symptom that is quite likely to supervene. It may extend to the tissues of the face, thorax, back, arms and abdomen.

Treatment. Undoubtedly in those cases where there is no deformity or depression of the fragments, no hemorrhage, emphysema, swelling or dyspnea, where laryngoscopy reveals no encroachment on the lumen of the larynx, expectant treatment is attended by satisfactory results in a certain number of instances. Under these circumstances the patient should be placed in a quiet room, in an atmosphere kept warm and moist. Complete silence should be enjoined, all efforts to use the voice being absolutely forbidden. Communication with the nurse or attendants may be had by means of a pad and pencil. Abstinence from food for a few days, nourishment and fluid being supplied by rectum. Under all circumstances very careful surveillance should be maintained. The attending surgeon should hold himself in readiness to deal promptly and decisively with any untoward development.

In the more urgent cases where the patient is seen soon after the accident, and is shocked, perhaps unconscious, with the face swollen and purple, the skin cold and the pulse feeble, the neck distended with a tympanitic, crepitating swelling which extends from the jaw down over the chest and may be visibly enlarging, immediate tracheotomy is demanded. The immediate indication is to free the air passage and it should be done at once and with any possible instrument as best

it can. Tracheotomy under these circumstances may be difficult, and when performed on a neck swollen and distended with blood and air, with landmarks obliterated and on a struggling patient, it is not the simple procedure that it is under circumstances less urgent. After the trachea is opened and a passage assured, it may be advisable to aspirate the tracheobronchial tree in as far as is possible by introducing a rubber catheter through the cannula and drawing out the blood and mucus with the aid of a syringe or bulb.

Artificial respiration may have to be resorted to after the passages are clear and the condition should not be regarded as hopeless until this has been continued for some time without success. Bronchoscopic oxygen insufflation is invaluable after bronchoscopic clearing of the airway. General anesthesia should be avoided, but in the event that it is necessary, the intratracheal method will insure the patient's safety and greatly facilitate the work of repairing the injured structures. After the air passages are open and the respiration established, one should undertake to repair the damaged tissues. A laryngo fissure may be performed and the traumatized tissues deliberately inspected and repaired. Displaced pieces of cartilage with intact blood supply may be replaced, blood clots removed, bleeding points ligated and lacerated mucous membrane repaired by suture. The suture should carefully approximate the torn margins without strangulation so as to avoid as much as possible death of the tissue and subsequent scar formation. Displaced cartilage may be fixed in position by suture though as a rule the thyroid cartilage holds sutures badly. The arytenoids may be replaced and secured by suture. If oozing of blood persists, the cavity of the larynx may be packed with gauze and the air current assured through the tracheotomy opening. The external wound should be carefully sutured in the

anatomical planes and proper drainage established. The tracheotomy wound should not be sutured but lightly packed with gauze. The dressings must be changed hourly and the utmost care taken to prevent the accumulation of tissue fluids and saprophytic organisms in the highly infected secretions from this type of wound.

The inner cannula should be cleansed hourly or oftener. The outer cannula should be removed at least once a day, cleansed, smoothed, polished, sterilized and fitted with clean tapes. For this daily toilet duplicate cannulae should be provided. The cannula should be removed at the earliest possible moment, it should be partially corked for a gradually increasing period of time on several days before it is completely removed, since as it is much easier to breathe through the neck the patient may resist all efforts at removal of the cannula. After operation the patient should be kept in a warm, moist room, silence enjoined and small doses of morphia and atropin administered to combat restlessness and limit as much as possible the amount of secretion. After the tube is removed and the wound healed, further intervention may be needed for the cure of strictures of the larynx, adhesions of the vocal cords and narrowing below the glottis.

If cicatricial stenosis is impending, it is better to do a laryngostomy at once. This procedure consists of splitting the thyroid cartilage in the midline; and the wearing of, first a pack, then a rubber tube in the larynx supported on a laryngostomy cannula, instead of the ordinary tracheal cannula, until the interior of the larynx is epidermatized with epidermal epithelium and the larynx is converted into an open trough. This requires many months of treatment during which the apparatus must be changed daily, and the size of the rubber tubing must be increased from time to time. The best way to increase size smoothly and evenly is to slip a rubber glove finger over the tubing. The

open trough is closed by a plastic operation after a six months' test period has demonstrated that the laryngeal stenosis will not recur.

Anastomosis of the Recurrent Laryngeal Nerve with the Descendens Noni. Encouraged by evidence of returning function after the first two operations, C. H. Frazier[7] has continued his observations on the effect of suturing the descendens hypoglossi to the recurrent laryngeal nerve. Up to the present time, twelve patients have passed through the clinic; in nine of these the paralysis of one or both vocal cords followed a thyroidectomy, in one a gunshot wound, and in one an attempt at suicide. One case was not of traumatic origin. Of this number, six patients have been operated on, two of them on both right and left nerves. Thus there were nine operations in all; once the recurrent nerve could not be found; in the remaining seven a satisfactory suture was effected. The ninth was a neurolysis. In three cases, already function is returning. The others have been operated on too recently to warrant a report.

Total paralysis implies paralysis of the intrinsic muscles of the larynx; that is, the dilators, the constrictors and the intrinsic tensor. With complete loss of function in those intrinsic muscles, there follow of necessity two outstanding clinical disturbances, aphonia and dyspnea. According to Jackson, the terms "complete" or "total" paralysis should be used only in the condition of the larynx in which not only are the abductors, tensors and adductors paralyzed, but the reflex tonus gone. In this total paralysis, the glottic chink is wider and the dyspnea lessened; there is much air waste and the voice is very husky. Pulmonary complications may develop from absence of glottis cooperation, and the patient may even drown in his own secretions.

According to whether the paralysis of the posterior

(7) Jour. Amer. Med. Ass'n., Nov. 22, 1924.

crico-arytenoid muscles is complete and bilateral will the dyspnea be more or less acute, and if bilateral and the cords have not assumed the cadaveric position, the respiratory embarrassment is such that a tracheotomy becomes a matter of urgent necessity rather than choice.

In six cases of the series, the patient had been tracheotomized; and while in most instances, with the finger over the cannula, the patient could talk in audible tones, the inconvenience and the annoyance of a permanent tracheotomy tube were such that there was ample justification for an attempt, by nerve suture, to restore function to the paralyzed cords.

Of the two sequelae of paralysis of the vocal cords, embarrassment of respiration is more constant than speech disturbance, for various reasons. Paralysis of the intrinsic muscles, the lateral crico-arytenoid and the thyro-arytenoideus, implies only more or less impairment of phonation, rarely aphonia. One may find a monolateral or bilateral paralysis of the recurrent laryngeal nerve in a patient with an excellent voice. Not until the lost tonus results in a cadaveric glottis is it that the husky "stage whisper" aphonic stage is reached. In fact, this stage may never be reached: at least, in one case it had not occurred at the end of 22 years.

The suitability of a given case for the operation under consideration is dependent on (1) the duration of the paralysis, (2) the motility of the crico-arytenoid joint and (3) the existence of an undamaged segment of nerve. Furthermore, in the selection of cases we must assume first an absence of organic subglottic stenosis, most often the result of a high tracheotomy for paralytic stenosis, and, secondly, absence of stenosis of the cervical or mediastinal trachea, such as compression by a substernal goiter, tumor, aneurysm, adenopathy or abscess. The pressure of such lesions is easily determined by bronchoscopy.

The technical considerations are perhaps the least absorbing, and concern only the few surgeons who are giving their time exclusively to neurosurgery. The principles to be observed do not differ from those of nerve suture elsewhere. As applied to this particular field, the question may come up whether a "lateral implantation" will be as effective as an "end-to-end" suture. This question can be answered only from the results of operations on other nerves. Lateral implantation in other cranial nerves (faciohypoglossus) and the peripheral nerves of the extermities has unquestionably been followed by functional recovery. In the case of the recurrent laryngeal nerve, the performance of a lateral implantation is more difficult because we are dealing with a nerve of slender proportions.

But certain conditions may prevail in individual cases in which one may hesitate to advise an end-to-end suture but might be willing to try a lateral implantation. Given a case in which the evidence of a total paralysis is lacking, muscle tone being preserved, one might hesitate to cut the recurrent laryngeal nerve in order to effect an end-to-end approximation with the ramus descendens hypoglossi, fearing, should regeneration not follow, that the patient's condition might be worse after the operation than before. It is under circumstances such as these that a lateral implantation should be the operation of choice.

Given a case in which the paralysis is almost but not quite complete and bilateral, total paralysis of one vocal cord would help rather than hinder the patient. In conditions such as these, it would be not only perfectly proper, but preferable, to cut the recurrent laryngeal nerve for end-to-end suture.

On the Possibility of Restoring Movement to a Paralyzed Vocal Cord by Nerve Anastomosis. The results

of the experiments carried out by L. Colledge[8] are divided into three groups.

1. *Anastomosis with the vagus.* The end of the recurrent laryngeal was implanted into the side of the vagus in two goats, a rhesus monkey, and a baboon. From the appearance of the vocal cords after ten months, it was concluded that although a nervous connection may be re-established by a recurrent laryngeal-vagus anastomosis, it is useless to expect return of spontaneous movement in the corresponding vocal cord.

2. *Anastomosis with the descendens noni.* This operation was done on four rhesus monkeys. The results showed that the muscles controlling the movements of the vocal cord become innervated, but no movement occurs in the cord because the appropriate impulse does not pass along this route. Thus, this operation is also useless for the relief of paralysis of the vocal cord.

3. *Anastomosis with the phrenic.* It appeared that if the vocal cord could be linked up with the muscles of respiration then a rhythmical impulse rightly timed would pass through the anastomosis and might restore the normal movements of quiet respiration to the cord. Four effective experiments were performed. Observations at various time intervals following the anastomosis showed that spontaneous respiratory movements can be restored to the vocal cord by an anastomosis between the recurrent laryngeal and the phrenic. The entire trunk of the phrenic is not necessary, and probably it will be found sufficient to use half the trunk, as in a lateral anastomosis, or one of the roots arising from the cervical nerves.

No case has so far presented itself in which an operation for the relief of a paralyzed cord appeared justifiable in the human being, but if such should be undertaken it is suggested that the appropriate operation

(8) Brit. Med. Jour., Mar. 21, 1925.

would be an end-to-end anastomosis between the recurrent laryngeal and the phrenic.

Cartilaginous Tumors of the Larynx (a Study of all Recorded Cases). No definite conclusions can be drawn as to the etiology of these tumors from a study of the recorded cases. Of the two theories "inflammatory metaplasia of fibrous tissue," or the "development theory," the latter is the more probable.

The most frequent sites of the growth are the endolaryngeal surface of the cricoid cartilage, the thyroid cartilage, the epiglottis and the arytenoids, in this order of frequency.

I. Moore[9] classifies the recorded cases under the following headings: (1) Ecchondromas or ecchondroses, 28 cases; (2) enchondromas, 28 cases; (3) mixed cartilagenous tumors, eight cases; (4) inflammatory neoplasms, one case; (5) hypertrophy or hyperplasis, five cases. These growths are usually solitary and sessile, presenting an immovable mass. They are most common in males, and are most frequent between the ages of 50 and 60.

The structure of the chondromas in general is that of permanent cartilage and the majority of cases include all types including hyaline, fibrous, and reticulated cartilage. The ecchondromas are the same structure as the cartilage of the larynx; that is, hyaline, and usually start from the deepest layer of the perichondrium. The true enchondromas develop in places where there should not be cartilage. The enchondromas may become cystic or ossified. The mixed cartilaginous tumors are often malignant.

The symptoms are variable, depending on the location of the tumor, its size and rate of growth. Hoarseness is usually the first symptom. Dyspnea may be late and only on exertion. Cough, aphonia and dysphagia may be present in the later stages. On laryngoscopic examination during phonation, the

(9) Jour. Laryngol. and Otol., March, 1925.

tumor is found subglottic, often extending to the middle of the larynx. If the tumor passes back beyond the upper boundaries of the larynx, toward the pharyngeal space, edema may be present. The diagnosis of chondromas is suggested when an external tumor of the neck is found very hard on palpation, fixed to the larynx and without evidence of inflammation; or if it springs from the posterior cricoid region and has a characteristic resistance on probing. Garel remarks that no other tissue gives this sense of resistance. An absolute diagnosis can always be made by removing a snipping from the growth for microscopic examination. The treatment is operative, and except in the small ecchondroses the method of choice is a preliminary tracheotomy, followed by thyrofissure. The author gives a summary of the end-results of the 62 recorded cases.

The Status of Radiation Therapy in Laryngeal Cancer. According to H. K. Pancoast,[1] cancer of the larynx, being of the squamous cell type, and highly resistant to radiation, requires that practically a caustic dose be applied to every portion of the growth to insure its complete eradication. Because of the anatomical peculiarities of the laryngeal structure such a dose as would be applied to a similar lesion elsewhere, as for example, to the uterine cervix, is prohibitive. Even a small part of such a dose would cause an intense perichondritis and destroy the cartilage, and thus break down the natural and most efficient barrier against the spread of the disease. As a result, rapid and extensive recurrence is favored, because our dose cannot be large enough to destroy every vestige of the growth. Superficial healing and apparent cure is a frequent experience but there is possibly not the same tendency for successful cicatricial encapsulation as is found in many other portions of the body.

(1) Amer. Jour. Roentgenol. and Rad. Therapy., September, 1924.

Applicators must be adjusted by indirect vision, under difficult conditions and often trying circumstances, and it is practically impossible to insure that the applicator will remain in adequate contact with every portion of the growth. Hence, unequal radiation is probably the rule, and especially just below the cords, from which locality so many recurrences seem to take their origin. Growths in the anterior portion of the larynx remain localized for a comparatively long period of time because of the natural barrier offered by the cartilage and the lack of lymphatic drainage to favor metastasis. Even in this locality, however, direct radiation has proven unsuccessful. The necessity of preserving the cartilage precludes the employment of bare emanation tubes in the tissues surrounding the growth. In posterior growths, where lymphatic drainage is free, metastasis occurs at a comparatively early period, and most growths here are too extensive when seen to respond satisfactorily.

The technic of surgical procedure directed toward laryngeal cancer has made remarkable strides forward, and surgery has apparently much more to offer now than it had in former years. It is true that the necessary skill lies in the hands of but a comparatively few men at the present time, but there is no reason why many others should not become equally as skillful and successful.

In small anterior growths, laryngofissure and complete excision of the growth is the operation of choice, and in the more extensive lesions laryngectomy is indicated. Even in some rather extensive growths with cervical lymph gland metastasis the latter operation has been successful. There is apparently no harm in giving postoperative radiations, provided the dosage is kept within bounds short of injuring the cartilage. Whether or not it is in any way efficacious is a matter of doubt at present. In extensive posterior growths, preliminary tracheotomy followed by

palliative radiation with moderate dosage seems to be the only procedure which can be followed.

Tuberculosis of the Larynx. According to St. Clair Thomson,[2] the physician should be prepared to encounter a laryngeal lesion in a considerable number of his consumptive patients. The two most suggestive symptoms will be—first, slight but persistent huskiness; and, secondly, discomfort referred to the throat, or even pain in swallowing. The latter is a symptom which is more frequent with advanced cases; therefore, for the all-important attainment of an early diagnosis, any hoarseness or any slight change in voice which does not clear up in two or three weeks should rouse suspicion and entail an expert examination of the larynx. But it must not be forgotten that tubercle occasionally invades the larynx without causing the slightest alteration of voice or any other local symptom.

Region of Larynx Attacked. Tubercle may deposit in any part of the larynx, but it may help towards an early diagnosis of more cases if a keen look-out is kept on the region most commonly attacked. It is quite certain that the favorite site is the neighborhood of the posterior commissure—that is, the interarytenoid area, the anterior surface of the arytenoid bodies, and the vocal processes (Fig. 58). The vocal cords come next in frequency, while the epiglottis and the region of the anterior commissure are attacked more rarely and are generally late extensions of the disease. The importance of bearing this fact in mind is that it is just around the margin of the posterior commissure that the disease is most curable, and yet it is an area which is frequently overlooked.

Of the 2,541 patients with pulmonary tuberculosis who were discharged from the King Edward VII Sanatorium, Midhurst, between 1911 and 1921, the proportion of those alive between one and ten years later

(2) Brit. Med. Jour., Nov. 8, 1924.

was, amongst those with a sound larynx, double that of those with tuberculous laryngitis. Of patients found to have tubercle in the larynx during these ten years, two out of every three were dead. Of those with a sound larynx, it is the reverse—two out of three were still alive. Of all the 477 cases of laryngeal tuberculosis which passed through the author's service at Midhurst between 1911 and 1921 no less than 70.5 per cent. are now dead.

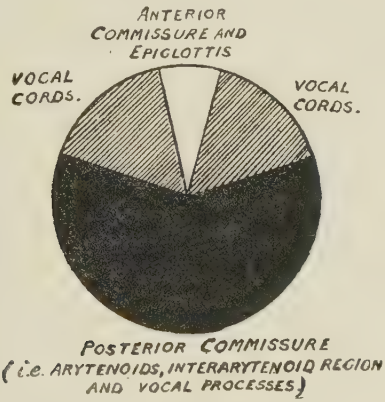

ANTERIOR COMMISSURE AND EPIGLOTTIS
VOCAL CORDS.
VOCAL CORDS.
POSTERIOR COMMISSURE (i.e. ARYTENOIDS, INTERARYTENOID REGION AND VOCAL PROCESSES)

Fig. 58.—Distribution of lesions in different regions of the larynx.

After Silence. Of 8 men cured by silence, 3 are alive at periods of one, two, and four years after discharge. The other 5 remained healed of their laryngeal lesions but have died from their pulmonary tubercle. Of 15 women, no less than 10 are alive and well after the lapse of two to ten years.

After Whispers. Healing has been maintained in some cases for three, four, and even ten years. Fifteen out of 27 men, and 13 out of 23 women, are still alive and well.

After Galvano-cautery. Of 46 cures, 28 are still alive, and in 6 of them the cured condition has per-

sisted for ten years. As with the two preceding groups, the patients who are dead have succumbed to their pulmonary disease and, generally, without any laryngeal recurrence. Even of these the author has been able to calculate that the average duration of life, after healing was complete, varied from two years and eight months in the men and to five years and two months in the women.

Benefit of a Healed Larynx. During these years the patients were able to use their voices, and this voice use was not only a pleasure to them, but it removed the anxiety and depression which so many patients suffer from when tubercle attacks the larynx. The recovered voice also assisted them in their social duties and in gaining a livelihood.

Lasting Laryngeal Cures. Thus of the 119 cases in which complete healing took place in the larynx, 69 are alive at periods varying from two to ten years afterwards. Fifty are dead, and they have died, as a rule, with a still cicatrized larynx. Their deaths, usually, were due to the extent or virulence of their pulmonary disease.

It is manifest that a patient has a more sure hope of a quicker cure inside a well conducted sanatorium than he can expect otherwise. Even if he remains in a sanatorium only long enough to learn how to manage himself, this sojourn is highly beneficial. This is shown by the number of cases which left Midhurst with the larynx still diseased but who kept up sanatorium principles and later on obtained complete and lasting cicatrization of their throat trouble.

The chief local requirement is voice rest, which can be so easily carried out in a sanatorium but is elsewhere so difficult. Out of 119 cases which were cured, the healing was obtained without other local treatment than voice rest (whispers or silence) in no fewer than 73 instances. That such a simple treatment—though long and arduous for the patient—can be so

effective should encourage perseverance with it when indicated.

Local surgical methods of cure have all been abandoned as useless and frequently harmful. The author's statistics show that a laryngeal lesion generally indicates an extensive lung lesion, or a very virulent infection, or lowered resistance. As things are at present, the majority of patients with laryngeal tuberculosis soon die (70.5 per cent.); they generally die of their lung disease. Topical surgical measures in the larynx are only apt to hasten this; their successful local results have never been frequent or enduring; the galvano-cautery is a safer and more certain help. The galvano-cautery has superseded all other topical measures—curetting, injections, insufflations, application of lactic acid or other caustics. The author has never seen a single case in which it has done harm, although in some it has been abandoned as useless. It effected a cure in 46 out of 74 cases in which it was tried (= 62.1 per cent.). Of these 46 cures, 29 are alive and well; 12 of them have not maintained their cure for ten years. The galvano-cautery is the best local treatment we have at present. In suitable cases it has replaced all other methods.

[A very satisfactory review of the problem of laryngeal tuberculosis. This condition is observed not so infrequently in patients where clinical evidences of an active pulmonary process are not detectable. The results obtained by disuse of the voice and the general regime for handling tuberculosis is often entirely satisfactory; even extensive ulcerations may heal without any local treatment.—Ed.]

A New Method of Local Phototherapy of Tuberculosis of the Upper Respiratory Passages. Wessely[3] reports his results of clinical experiments with the treatment of tuberculosis of the upper respiratory passages by local application of artificial light resemb-

(3) Ztschr. f. Hals, Nasen u. Ohrenhlk., 10:278.

ling sunlight. His light source is an arc-light, the pure carbon spectrum of which is completed up to the wave-length 290 uu by adding metallic salts and which, therefore, embraces the entire ultra-violet of high altitude sun. In order to shorten exposure to irradiation as much as possible the superficial brightness is doubled by means of a system designed by the Goerz optical works. Dosage depends merely on the duration of exposure, as only small surfaces are irradiated. Hence, only time and not distance must be considered. By means of a suitable quartz system the light is made to form a cone. Heat rays are absorbed by an intercepting water jacket.

The light is applied by reflection directly to the diseased part. In place of the customary laryngeal speculum the author employs nickel and steel mirrors, giving an equable and economical utilization of light. The mirror is fixed in the patient's mouth by a suitable appliance. Irradiations are given first every other day and later at longer intervals, for seven to ten minutes at each sitting. Treatment is continued, according to the nature of the case, for periods varying from a few weeks to one and one-half years.

Local light treatment is successful, not merely in localized afebrile cases, but also in extensive processes not suited to other local treatment and further in febrile cases, but only with exact observations of the lungs, temperature, weight, rapidity of sedimentation, and so forth. Good results are obtainable also during pregnancy. However, in cases where the regenerative power has fallen below a certain limit, light will fail to induce reparative processes. With the aid of colored sketches the author shows the manner in which tuberculosis of the upper respiratory passages may heal under the influence of light.

Of 164 cases treated 46 were cured locally, 32 improved, 20 remained uninfluenced, and 24 became worse. In 23 of 42 patients treated symptomatically

for dysphagia the pains were removed, in 11 they were improved transitorily and in 8 they were not influenced.

Laryngeal Manifestations of Syphilis, From the Standpoint of Differential Diagnosis. According to F. O. Lewis* laryngeal syphilis may be acquired or inherited. It is more frequently seen in men than in women in the acquired group. Fifteen per cent. of syphilitic patients show laryngeal involvement on the post mortem table. The primary lesion is practically never encountered in the larynx.

Secondary manifestations may occur in the form of an erythema, or, rarely, as mucous patches. The lesions may make their appearance any time from a few weeks to two years after infection. The erythema cannot be differentiated from acute laryngitis from its appearance. However, in the luetic cases. lesions are usually also present in the mouth, pharynx or skin. A unilateral congestion of one vocal cord is more suggestive of tuberculosis. In malignant disease the congestion is usually associated with a localized induration or irregularity of the cord, which often interferes with its mobility. Mucous patches have been seen on the vocal cords, aryepiglottic folds and arytenoids, but more frequently they are found on the lingual surface of the epiglottis.

Tertiary lesions are the ones more frequently seen in the larynx, and appear in the form of gummata, ulceration, and perichondritis. The diagnosis in the majority of cases is difficult. The conditions to be differentiated are tuberculosis, malignancy, lupus, pachydermia laryngis, and benign growths of the larynx.

A positive history of a syphilitic infection is a great help in the diagnosis. However it is seldom obtained. In the differential diagnosis of tertiary lesions of the larynx, a complete physical examination is always essential, including bacteriological and serological

(*) Atlantic Med. Jour., July, 1925.

tests, with the added information which may be obtained by the use of the *x*-ray. The laryngeal picture, as a rule, presents characteristic differences. The syphilitic ulcer is frequently unilateral, deep, with sharp irregular edges and hyperemic areola, progresses rapidly, and its base is covered with a dirty gray or yellowish slough. The tuberculous ulcer is superficial, small, numerous, has ill defined edges and is surrounded by an area of anemia, having the so-called "worm-eaten" appearance. The malignant ulceration is situated on an indurated base. It is usually deep, with everted edges, and covered with a foul-smelling, blood-stained slough. In the absence of definite findings, a sufficient amount of the tissue should be removed by an intralaryngeal surgeon, and submitted for examination to an expert pathologist.

Lupus of the larynx is characterized by small nodules, which develop slowly. Later, softening occurs, producing a serpiginous form of ulceration, with well-defined edges. Pachydermia laryngis has occasionally been seen in the larynx. It is a chronic form of inflammation, with a circumscribed thickening of the mucous membrane, involving usually the vocal chords and the interarytenoid space. It does not produce general manifestations. The gummatous form of laryngeal syphilis might readily be mistaken for some benign growth, and is best differentiated by the use of the microscope.

Inherited syphilis of the larynx is said to occur about as frequently as the acquired form. It is usually seen during the first six months after birth, but the symptoms may develop much later in life. The pathological manifestations are very much the same as in the acquired form. It must, however, be remembered that the laryngeal lumen in children is much smaller than in the adult, and that the thickening of the mucosa, or a sudden edema, would produce dangerous complica-

tions. The diagnosis is seldom difficult, as other manifestations are almost invariably present.

Acute Septic Tracheitis. Three cases are reported under this title by J. G. Strachan.* The cases all occurred in healthy, robust, male children, between the ages of two and nine years. They developed in the months of January, February and March. In each case the onset was sudden with dyspnea, hoarseness, and fever, the dyspnea becoming progressively worse. Although hoarseness was present, in no case was the voice lost. The obstruction was subglottic and was relieved by tracheotomy, intubation being of no avail.

The cases were thought at the first to be laryngeal diphtheria and were treated as such. Cough, although present, was negligible.

On examination the mucosa of the nose, pharynx, and larynx was of normal appearance. The vocal cords were pale and slightly edematous. The appearance of the trachea as seen through the glottic chink was very similar in each case. Beginning immediately below the true cords the trachea seemed lined by a greenish gray exudate. In the early stages the lung signs were absent except for a poor air entry to both sides.

The progression of the disease was rapid. The dyspnea was very troublesome and the toxemia great. The duration in each case was about three days. Toxemia was the apparent cause of death, but no doubt the labored breathing must have been a factor in the myocardial fatigue.

Examination post mortem showed varying degrees of superficial ulceration of the tracheal mucosa, very marked in the subglottic region and diminishing in the lower part of the trachea. In one case, that in which the duration had been somewhat shorter than the others, the lower third of the mucosa appeared normal. Bronchitis was present in each case in some degree.

(*) Can. Med. Ass'n. Jour., July, 1925.

Bronchopneumonia was present also but in no case was it widespread.

Lesions of the Trachea in Pulmonary Tuberculosis. The anatomical situation and inaccessibility of the trachea may account for the small amount of consideration which it has received in cases of pulmonary tuberculosis. Yet by virtue of its position it certainly deserves attention, as it is a channel of considerable length through which many virulent organisms pass on their way to or from the lungs.

In a series of 133 autopsies F. R. Heaf[4] found the trachea showed abnormal features in 44 per cent. of the cases. A small amount of congestion of the mucous membrane was not taken into account in arriving at this figure, as it was present in almost all the cases.

The lesions vary from a slight edema of the mucous membrane to a general ulceration of the whole surface. The mucous membrane becomes increasingly congested until it is a deep purple in color and considerably thickened by edema. The surface then begins to desquamate and small superficial ulcers form. These gradually coalesce so that a large irregular shallow ulcer is formed, having a slightly raised edge but with very little induration. The walls are ragged and soft, and are surrounded by an area of deeply congested tissue. The lesion is generally confined to the area just proximal to the bifurcation of the trachea, but occasionally assumes a diffuse form, the whole surface of the trachea becoming covered with numerous irregular shallow ulcers.

On reviewing the clinical notes of the cases which exhibited gross tracheal lesions, the author found that all the patients had complained of a loud distressing cough of a paroxysmal character and very refractory to treatment. With the cough there was deep-seated retrosternal pain and a raw aching sensation across

(4) Lancet, Oct. 4, 1924.

the chest after a bout of coughing. All the cases suffered from dyspnea and a feeling of tightness across the chest. None exhibited any superficial tenderness over the sternum. Generally there was little sputum, and the lungs at autopsy displayed extensive fibrosis.

Treatment seems to have been difficult and at most only palliative, but a fair amount of relief from the painful bouts of coughing was obtained by frequent insufflations of pulv. anesthesin and orthoform in equal parts, administered through a Leduc's tube.

[Intratracheal injections of the following solution:

Guaiacol, 1%.
Menthol, 1%.
Eucalyptol, 1%.
Russian Oil, qs.

will give substantial temporary relief from the paroxysmal coughings.—Ed.]

Voice and Speech Disorders

A Broader Approach to Unsolved Problems in Laryngeal Action. The object of this article by E. L. Kenyon[5] is threefold: (1) to point out certain broad principles bearing on the relationship of the extrinsic musculature to vocal action; (2) to suggest the need of further developing the new manner of diagnosis with reference to the extrinsic musculature; (3) to stimulate laryngologists to giving diagnostic consideration to the extrinsic musculature. For six years the author has employed a more or less systematic study of the extrinsic musculature in both normally and abnormally acting larynges. These observations have led to the following conclusions:

(1) The intrinsic musculature of the larynx possesses physiologically no power of adductive action independent of the extrinsic musculature. (2) The extrinsic musculature is an important factor in facil-

(5) Laryngoscope, November, 1924.

itating adductive action of the vocal cords in general, and especially in determining their finer adductive adjustments. (3) The importance of the extrinsic musculature in certain disturbances of vocal cord action has been demonstrated. (4) Solution of certain problems in disturbed laryngeal action depends largely on the simultaneous study of vocal cord action intrinsically, and the action of the extrinsic musculature. The action of the extrinsic muculature has thus far been studied by the author by finger palpation. The value of a generally broader point of view in the study of certain laryngeal problems is illustrated by examples drawn from the literature.

Laryngology and Singing. According to Molinié[6] there has been a tendency to place the method of instruction in singing on a physiologic basis; but unfortunately the physiologic theories adopted for this purpose generally seem to be very much behind the times. To quote only one example, one can hear the opinion expressed that vowels are formed in the larynx and arrive ready-made in the mouth, only waiting to be issued. In refutation of this it suffices to point, on the one hand, to the simple artificial device (a vibrating reed, as in a child's trumpet) by which laryngectomized patients are enabled to speak, and on the other, to the unfortunate soldiers in the late war whose tongues are paralyzed in consequence of injury to the hypoglossal nerves, and whose intact larynxes do not enable them to utter any ever so slightly differentiated vowels.

The practical side of the question is exemplified by young persons who are taking a course in singing, and from whom the laryngologist, consulted on account of laryngeal troubles, learns to what tortures they subject their vocal organ in the interests of "the education of the cricothyroid muscle and its progressive contraction."

(6) Rev. de Laryngol., d'otol., et de rhinol., Jan. 15, 1925.

The author insists that this whole subject ought to be taken up in the immediate future by a laryngologic congress. He is convinced that the outcome of such an investigation would greatly benefit the physicians as well as their patients, and the teachers of singing no less than their pupils.

Professional Dysphonia of Singers. In this article C. Braggi[7] discusses the following:

Chronic Dysphonia. This develops from acute dysphonia, if the resorption of the inflammatory exudates of the vocal cords is interfered with by repetition of the causative conditions or by untimely exertion of the larynx. In this form, there is never complete restitutio ad integrum. If the mucosa alone is affected, nearly the whole scale can be sung with a more or less clear voice; but if the thyro-arytenoid muscle is involved, the voice becomes lowered and raucous. In the latter condition, the vocal cords are of a dirty white color with rounded internal borders and often streaked longitudinally by small blood-vessels. In the worst cases, the cords appear divided by longitudinal furrows.

Hyperfunctional Dysphonia. Hard work, when performed without infringing on physiologic laws and followed by normal rest, has rarely any untoward consequences. In most cases, the singers who seek medical advice have sinned against their art by attempting parts to which their voice is not equal and thus disturbing the equilibrium between the different parts of the larynx and their respective functions. In mild cases, laryngoscopy reveals slight troubles of motility (relaxed cords, and so forth); in severe cases, the cords are of a whitish color with a brilliant pearly-white nodular enlargement on the anterior third of the free border. In other cases, there are small polypoid growths on the anterior commissure and the ventral surface of the cords. Apart from the surgical inter-

(7) Arch. internat. de laryngol., January, 1925.

ference indicated in such cases, rational vocal gymnastics are helpful.

Functional Deficiency Dysphonia. This is the result of faulty "placing" of the voice, as brought about by functional adaptations and compensations between the muscle groups of the vocal organ in interaction with individual psychophysical characteristics. Three factors deserve special notice.

1. The mechanism of the respiratory apparatus furnishing the motive power of sound. The time and depth of inspiration, the value of the interval, and the proper distribution of the expiration over the whole phrase should be carefully examined with the pneumograph. The correct participation of the diaphragm and a proper relation between the laryngeal and pharyngeal resistance on the one hand and the force of expiration on the other are points of importance. The use of residual air by compression of the abdominal walls, which should be tolerated only as a makeshift, to make up for insufficient inspiration, is stupidly recommended by some teachers as "increasing the pulmonary capacity." The use of rigid or elastic belts and corsets is strongly to be condemned.

2. There are three methods of attack in producing musical sounds: "*coup de glotte*" (the "closed-glottis" attack of the German authors), in which the action of the larynx may be compared to that of the lips in producing an explosive P; "*coup de poitrine*" (the "open-glottis" attack), the effect of which might be likened to the sound of an H preceding the voice (the "rough breathing" of the philologists); and the "soft attack," corresponding to the "smooth breathing." This is the only legitimate method for constant use, the only method by which a singer can achieve the greatest perfection of which his organ is capable. The "*coup de glotte*" may be used occasionally for the production of certain effects.

3. Each individual voice has a personal timbre, on

the basis of which the singer has to develop the emotional timbre, both excitative (corresponding to the major key) and depressive (corresponding to the minor key). The latter depends on open communication between pharynx and nose, *i. e.*, on incomplete contraction of the soft palate, which favors the development of insufficiency of the tonus of the elevators. Discretion in either direction is necessary.

Modern Conception of Stuttering and Stammering. M. Solomon[8] defines stuttering or stammering as a recurrent transient inability to pronounce a word or syllable or sound, as the result of which the individual undergoes an internal or mental struggle to pronounce the word or syllable or sound.

It is the author's belief that the disorder is not due to any permanent organic condition, but on the contrary, is a habit formation which has for its groundwork a certain mental state and a certain nervous makeup. Stammering occurs three times as frequently in the male as in the female, and 95 per cent. of cases begin during the speech development period. The condition is not inherited as a disease entity, although the nervous system in the stammerer may be hereditarily over-irritable.

Exciting Causes. A tendency to nervous and mental excitability and emotionality is present. It may be due to a nervous system unusually irritable from hereditary or congenital causes, or from trauma (accidents or blows), disease (especially slow convalescence), malnutrition, environmental conditions (especially bad home training, poor living conditions with bad parental example). Imitation occasionally may be an immediate exciting cause, but only when the other conditions have already produced a state of nervous and mental excitability.

Accidental hesitancy and stumbling in speech may eventually lead to stammering.

(8) Illinois Med. Jour., February, 1925.

The author discusses normal speech mechanism, and the mechanism of stammering. In conclusion he gives the following hints on the treatment of the condition:

1. Convincing the individual that he can get well.
2. The desire on the part of the individual to be cured.
3. The patient must be willing to work for his cure.
4. We must establish self-confidence in him.
5. Everything necessary to improve his physical, nervous and mental poise should be done.
6. The nature of his trouble, along the lines indicated should be clearly pointed out to him, if he is old enough to understand.
7. We must endeavor to overcome his general tendency to hurry and rush, especially during speech.
8. Slow speech should be insisted upon.
9. He should, when in oral spasm, always open his mouth quickly for the vowel following an initial consonant; close his mouth when he finds himself unable to leave a vowel; relax his respiratory apparatus, or breathe calmly or slowly, or begin over again when he finds himself in a state of respiratory spasm.
10. In some cases special exercises to increase visual or auditory imagery during speech may be helpful by compelling the patient to speak more slowly, and to live more fully in what he is saying, thus producing a state of calmness and poise.
11. In the same way, special exercises for different parts of the speech apparatus, especially vocal gymnastics, may be used with the object of giving the patient greater faith in himself, and in developing a fuller and more resonant voice.
12. Exercises for breath control, vowel lengthening and consonant production, and exercises to improve visual or auditory imagery cannot by themselves produce the cure of stammering.
13. The stammerer should not look forward to a sudden or miraculous cure but should be willing to work

for gradual improvemnt with ultimate success.

14. In the end his progressive improvement and the permanency of his cure will depend upon his careful carrying out of these principles.

Bronchoscopy and Esophagoscopy

The Contraindications to Bronchoscopy. Bronchoscopy, according to E. H. Funk[9] as a *diagnostic* procedure is contraindicated:

1. In a patient who has not been carefully studied before contemplating bronchoscopy.
2. In the presence of aortic aneurysm.
3. If there has been a recent hemorrhage. This, however, is subject to individual interpretation.
4. If there is active tuberculosis.
5. In moribund patients.

The contraindications to bronchoscopy as a therapeutic procedure are:

1. Purulent pneumonia, or that suppurative lung lesion like purulent pneumonia, which precedes the formation of an abscess.
2. Multiple abscess formation.
3. Extensive bronchiectasis, involving the whole lung or greater part of both lungs.
4. Localized abscess near the periphery of the lung, and unlikely to drain satisfactorily through the tracheobronchial tubular system.
5. Localized bronchiectasis associated with marked distortion of structures, due to marked fibrosis.
6. The presence of marked cardiac weakness.
7. The presence of a serious complication in a patient whose pulmonary lesion would indicate its use.

The Bronchoscopic Treatment of Pulmonary Suppurations and Bronchial Asthma. After discussing

(9) Arch. Laryngol., February, 1925.

the etiologic factors in pulmonary suppurations, W. F. Moore and R. M. Lukens[1] mention in detail their treatment of these conditions. They believe that the use of one method to the exclusion of all others is a mistake. Therefore, when a patient with a pulmonary suppuration presents himself or herself at the clinic the following procedures are instituted:

The chest findings are ascertained by an internist, who also makes a thorough study of the patient for organic disease, after which the patient is referred for roentgen ray examination. Tuberculosis is excluded so far as possible by the usual diagnostic means. With the information thus obtained it then becomes a question of whether or not the case is one for a diagnostic bronchoscopy.

This preliminary work is necessary not because the bronchoscopic procedure is in any way dangerous, in proper hands, in a fit subject, but suitability of the case for bronchoscopic examination and treatment must be determined on the broadest scientific principles, not only for the best interests of the particular case under observation, but for the development to the fullest extent of criteria by which suitability can be determined in future cases.

Having localized, so far as possible, an abscess or bronchiectatic condition, a diagnostic bronchoscopy is performed. The condition of the mucous membrane of the tracheobronchial tree is noted as the bronchoscope is inserted. Two of the most important points to be carefully watched for are: (1) The bronchus or bronchi from which suppurative products are exuding; (2) the presence of any factor which would constrict the lumen of the bronchus, and thus inhibit free drainage.

At this examination uncontaminated specimens of the secretion are taken, either by swab through the bronchoscope, or, if the quantity is sufficient and not

(1) Atlantic Med. Jour., September, 1924.

too viscid, the collection is made by aspiration into a specially devised tube, which can immediately be sealed and sent to the laboratory.

From these specimens, uncontaminated by oral infections, autogenous vaccines are made in each case. These vaccines are given twice a week. Fresh vaccines are made up at two-month intervals because the predominant bacterial content changes in patients under treatment. This change may be due in part to the treatment.

The patients are carefully instructed to aid by posture, the drainage of the affected area.

Absolute bed rest is not insisted on unless there is fever or weakness, but an abundant nutritrious diet, as for tuberculous patients, is outlined. Fatigue must be avoided and rest in bed a definite number of hours (14 to 18) each day to conserve strength and to build up a reserve is recommended.

At the second bronchoscopic treatment the bronchi draining the affected area are first thoroughly aspirated, using either the Jackson aspirating bronchoscope, or in case of the small bronchi whose lumen will not take the scope, using an independent aspirating tube inserted through the bronchoscope. The cleansing is done with a special solution containing: Trinitrophenol, 2 gr.; Lugol's solution, 1 drachm; normal saline solution, 1 pint. This completes the treatment in some cases. Seven-day intervals are usually allowed between bronchoscopies.

In cleansing, large areas are never treated at one time, and flooding of healthy lung tissues is carefully avoided. The tributary branch bronchus is attacked separately, excluding the main trunk, and with a specially devised apparatus. The return flow is always greater than the intake. A washing action is thus secured, and at the end of the treatment very little fluid is retained. This guards against a scattering of the infection to normal areas. Vegetable oils have

been found very unsatisfactory. Only mineral oils are used. These at times are used either after irrigation or instilled after aspiration without any irrigation.

The lumen of a constricted bronchus is dilated at each bronchoscopy. Obstructing granulations sometimes require removal, but usually granulations disappear after purulent accumulations are prevented by bronchoscopic aspirations.

Bronchoscopy is done without anesthesia or sedative in children, and without general anesthesia in adults.

These patients are so little affected by this procedure that they are able to leave the clinic for their homes almost immediately and are treated as dispensary patients. Hospitalization is not required, though sometimes out-of-town patients are put in the hospital for preliminary study.

Results. An analysis of the cases of pulmonary abscess treated at the clinic, including those complicated with bronchiectasis, in percentages, is as follows: Cured 21.4 per cent.; improved, 57.2 per cent.; unimproved, 21.4 per cent. Patients are willing to continue the treatments as long as is advisable, because of the lessening of cough and foul expectoration, and improvement. The authors have had no patient who declined further treatment because of any dread of a repetition of the bronchoscopic treatment. Diagnostic bronchoscopy is indicated:

1. In any patient in good general condition, and with a not too extensively diseased lung.

2. In any case in which the internist desires the aid of bronchoscopy with aspiration or medication as an addition to his general measures.

Bronchoscopy is contraindicated:

1. In cases of recent profuse hemorrhage.

2. In a moribund patient.

3. In very extensive disease of lung tissue, involving one-half or more of one lung.

4. In organic disease of the heart and great vessels.

5. In laryngeal tuberculosis.

A large group of cases of bronchial asthma are being treated. An autogenous vaccine is made at the first bronchoscopy; then a medicated solution is instilled, first in the right and then in the left main stem bronchus. The following is the formula most frequently used: 20 drops 1-1000 adrenalin sol.; 10 drops (10 per cent.) cocain; normal saline solution, 1 drachm.

The treatments are given at seven-day intervals generally for the first three times, after which the patient reports not oftener than once every three weeks or a month. However, in each case they report only on recurrence of asthma. Sixteen cases have been treated and 50 per cent. have shown marked improvement.

Lung Abscesses Cured by Bronchoscopy. Six cases of lung abscess cured by bronchoscopic means are reported by M. C. Myerson.* The longest duration of any of these cases was three months. The important conclusion to be drawn from this is that to be successful, the patient must be seen early enough. The temperature drops, the odor and cough disappear and the amount of sputum is considerably lessened. In cases of long or moderately long duration the results are never so good.

In the bronchoscopic treatment of these suppurations, a cure is accomplished in the following two stages:

First Stage: 1. Aeration. 2. Irrigation. 3. Evacuation.

Second Stage: 1. Collapse of the cavity. 2. Replacement fibrosis.

The second stage is a purely natural process.

Aeration is accomplished usually by the mere straightening out of the bronchial tree down to the secondary emptying branch by the bronchoscope. Occasionally it may be found necessary to remove ob-

(*) Arch. Otolaryngol., August, 1925.

structive granulations. A majority of cases seen are anaerobic infections, so that aeration destroys the anaerobes and the odor that goes with them. The irrigation is carried out by introducing the solution into the emptying secondary bronchus while the suction apparatus is taking away the thick, viscid exudate that is liberated and forced out by the irrigation. The periphery of the abscess cavity must be compressible or collapsible if a cure can be hoped for. Anything in the pathologic process that will interfere with the collapse of the cavity will prevent a cure. It is evident that bronchoscopic treatment is not applicable in cases of multiple abscess, nor in abscesses of large extent.

Foreign Bodies of Dental Origin in the Lungs. An analysis of one hundred and seventeen cases is made by E. G. Gill.[2] In presenting this subject, a careful effort has been made to review the reports of all cases that have been published in this, as well as in foreign countries. No attempt to review cases through personal communication has been made. A few cases giving fragmentary reports of foreign bodies of dental origin have been reviewed but not included in the analysis.

In this type as well as in other types of foreign bodies, the right bronchus is the favorite site of lodgment, the ratio being 2:1 in the series, 56 being in the right, 28 in the left bronchus, and one in the trachea. The location was not stated in 29 cases.

The majority of accidents occurred while the patient was under an anesthetic, gas anesthesia having been employed in nineteen cases, ether in twenty, chloroform in three, and rectal anesthesia in one case. In case reports stating that extraction had been done under general anesthesia, it was supposed that ether had been used, and this probably accounts for the greatest number of accidents occurring under ether anesthesia. The remaining accidents occurred in the following order:

(2) Jour. Amer. Med. Ass'n., Nov. 29, 1924.

aspirated, time not stated, four; during sleep, two; while eating, one; while coughing, two; while in the dental chair, none; when kicked by a horse, one; when making a cast for the mouth, two; while in petit mal, two; while in intoxicated stupor, one.

The nature of the accident was not stated in fifty cases. In all but one case, some operation about the mouth was being performed when the accident occurred.

Foreign bodies of dental origin produce symptoms similar to those arising from other inorganic objects. The train of symptoms to be expected are cough, pain in the chest, hemoptysis and dyspnea. These may be the only symptoms produced for years, while, on the other hand, lung abscess may develop within a very short time. Warrick and Monro report cases of death on the tenth and on the sixteenth day following the aspiration of teeth. In each instance the entire lung was gangrenous.

This much can be said with certainty: "If a foreign body is aspirated into the bronchi and allowed to remain, abscess formation will likely follow, in the majority of cases."

The sojourn in the lungs of the foreign bodies presented varied from four hours to thirteen years. In this series there were two cases of foreign bodies, of five years' sojourn in the lungs, which produced no symptoms other than cough and hemoptysis. In one case reported by Lynch, plaster of Paris had been aspirated and in the other case reported by the author the foreign body was a dental plate. Both patients made complete recoveries after bronchoscopic removal.

Of the 117 patients in the entire series 84 recovered. The results were uncertain in nine, and there were 24 deaths. Fourteen patients died as the result of lung abscess, one following tracheotomy, three from symptoms simulating tuberculosis, one from bronchiectasis,

one from pneumonectomy; in three cases, the cause of death was not stated.

Of the 84 cases in which the patients recovered, the foreign body was removed bronchoscopically in 38 instances; it was coughed up in 37 instances; it was removed by lower bronchoscopy through tracheal openings in five instances, and by successful tracheotomy in three, and one patient was relieved by artificial pneumothorax.

The author concludes that:

1. In every operation about the mouth, care should be exercised to prevent aspiration infection.

2. Symptoms in most cases are immediate; namely, cough, pain in chest and hemoptysis.

3. Later symptoms may simulate pulmonary tuberculosis. Seven cases in this series were diagnosed as tuberculosis. Tuberculosis may coexist with lung abscess.

4. Bronchoscopy is indicated in any case as a diagnostic measure if the history and roentgen ray findings are not conclusive.

5. When the presence of a foreign body has been definitely established, there is only one treatment—bronchoscopy.

6. Expectant treatment is always hazardous, and lung abscess may develop at any time.

7. Death is due in most instances to lung abscess, bronchiectasis and grangrene.

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